

Chapter 4

Bothell Surface Water Design Manual



City of Bothell™

Design & Construction Standards And Specifications

Prepared by



Foreword

This is Chapter 4 of the City of Bothell Design and Construction Standards and Specifications. This updated version has been created to adopt the 2005 Ecology Stormwater Management Manual and meet requirements of the NPDES Phase II Municipal Stormwater Permit.

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Section 1 - Definitions

For the provisions of this manual, the following definitions allow readers to review terms used in this manual and limit the need for interpretation by the reader.

- **Arterial** - A road or street primarily for through traffic. A major arterial connects an Interstate Highway to cities and counties. A minor arterial connects major arterials to collectors. A collector connects an arterial to a neighborhood. A collector is not an arterial. A local access road connects individual homes to a collector.
- **Certified Erosion and Sediment Control Lead (CESCL)** - means an individual who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by the Department (see BMP C160 in the Stormwater Management Manual for Western Washington (2005)). A CESCL is knowledgeable in the principles and practices of erosion and sediment control. The CESCL must have the skills to assess site conditions and construction activities that could impact the quality of stormwater and, the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges. Certification is obtained through an Ecology approved erosion and sediment control course. Course listings are provided online at Ecology's web site.
- **Common plan of development or sale** - a site where multiple separate and distinct construction activities may be taking place at different times on different schedules, but still under a single plan. Examples include: phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g. a development where lots are sold to separate builders); a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; and projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility. If the project is part of a common plan of development or sale, the disturbed area of the entire plan shall be used in determining permit requirements.
- **Effective impervious surface** - Those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces on residential development sites are considered ineffective if the runoff is dispersed through at least one hundred feet of native vegetation in accordance with BMP T5.30 - "Full Dispersion," as described in Chapter 5 of Volume V of the 2005 Ecology Manual.
- **Financial guarantees** - Guarantees in the form of performance and maintenance bonds. See Chapter 1, section 1-5 of City of Bothell Design and Construction Standards and Specifications.
- **Geologically hazardous areas** - Areas susceptible to erosion, sliding, earthquake, or other geological events. They pose a threat to the health and safety of citizens when incompatible development is sited in areas of significant hazard (WAC 365-190-080(4)). Such incompatible

development may not only place itself at risk, but also may increase the hazard to surrounding development and use. Areas susceptible to one or more of the following types of hazards shall be designated as a geologically hazardous area:

- A. Erosion hazard;
- B. Landslide hazard;
- C. Seismic hazard; and
- D. Other geological events including mass wasting, debris flows, rock falls, and differential settlement. (Ord. 1946 § 3, 2005).

- **High-use site** - Are sites that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. Refer to Section 2, Volume I, 2.5.6 of this manual for additional information.
- **Impervious surface** - A hard surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.
- **Land disturbing activity** - Any activity that results in movement of earth, or a change in the existing soil cover (both vegetative and nonvegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices are not considered land-disturbing activity.
- **Landslide hazard areas** - (Landslide hazard areas definition can be found in BMC 14.04.005).
- **Landslide Hazard Drainage Area (LHDA)** - Area which contributes runoff, directly or indirectly, to a landslide hazard area.
- **Maintenance** - Repair and maintenance includes activities conducted on currently serviceable structures, facilities, and equipment that involves no expansion or use beyond that previously existing and results in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems. Those usual activities may include and replacement of dysfunctional facilities, including cases where environmental permits require replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed. One example is the replacement of a collapsed, fish blocking, round culvert with a new box culvert under the same span, or width, of roadway.

- **Master Drainage Plan** - A plan that proposes specific drainage control systems that will prevent significant adverse impacts to the site's natural hydrologic system and to existing and planned offsite drainage systems and natural resources.
- **Native vegetation** - Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site historically. Examples include trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.
- **New development** - Land disturbing activities, including Class IV - general forest practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of impervious surfaces; and subdivision, short subdivision and binding site plans, as defined and applied in Chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development.
- **Pollution-generating impervious surface (PGIS)** - Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in the glossary); or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall.

Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the rainfall runoff. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating).

A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads, unvegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unfenced fire lanes, vehicular equipment storage yards, and airport runways.

The following are not considered regularly-used surfaces: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, fenced fire lanes, and infrequently used maintenance access roads.

- **Pollution-generating pervious surfaces (PGPS)** - A nonimpervious surface subject to use of pesticides and fertilizers or loss of soil. Typical PGPS include lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields.
- **Pre-developed condition** - The native vegetation and soils that existed at a site prior to the influence of Euro-American settlement. The predeveloped condition shall be assumed to be a forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement.

- **Project site** - That portion of a property, properties, or right of way subject to land disturbing activities, new impervious surfaces, or replaced impervious surfaces.
- **Receiving waters** - Bodies of water or surface water systems to which surface runoff is discharged via a point source of stormwater or via sheet flow.
- **Redevelopment** - On a site that is already substantially developed (i.e., has 35% or more of existing impervious surface coverage), the creation or addition of impervious surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities.

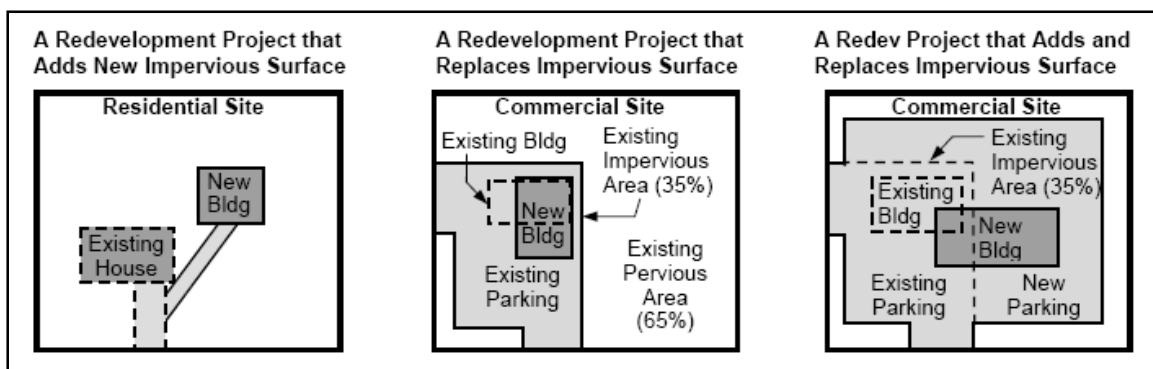


Figure 1.1 Diagram of impervious surface scenarios. Courtesy of King County

- **Replaced impervious surface** - For structures, the removal and replacement of any exterior impervious surfaces or foundation. For other impervious surfaces, the removal down to bare soil or base course and replacement.
- **Single Family Detached Residential Project** - Any project that constructs or modifies a single family dwelling unit, makes improvements such as a driveway or play court, or clears native vegetation that will contain a residential dwelling, or is a plat/short plat/boundary line adjustment that results in lots that contain single family dwelling units.
- **Site** - The area defined by the legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment. For road projects, the length of the project site and the right-of-way boundaries define the site.
- **Source control BMP** - A structure or operation that is intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. This manual separates source control BMPs into two types. Structural Source Control BMPs are physical, structural, or mechanical devices, or facilities that are intended to prevent pollutants from entering stormwater. Operational BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater. See Volume IV of the 2005 Ecology Manual for details.

- **Threshold Discharge Area** - An on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flow path). The purpose of this definition is to clarify how the thresholds of this manual are applied to project sites with multiple discharge points.

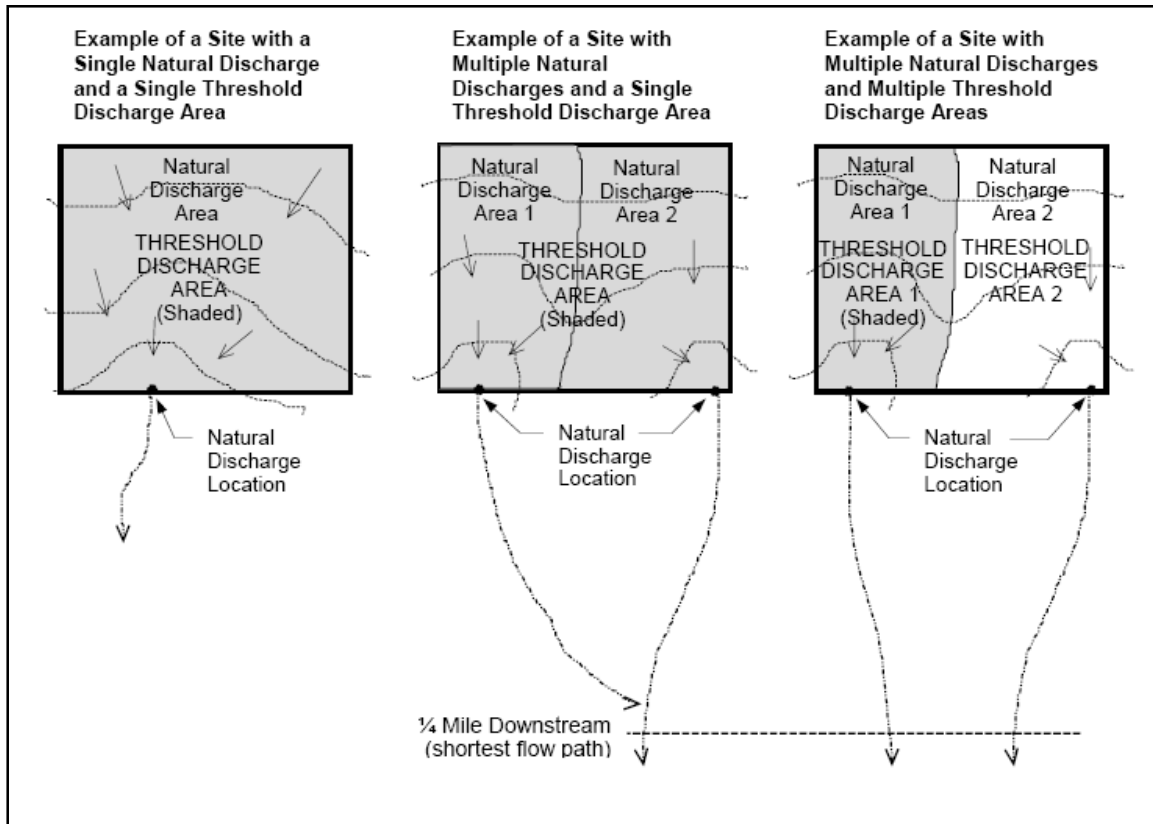


Figure 1.2. Diagram of Threshold Discharge Areas. Courtesy of 2005 Ecology Manual.

Section 2 - Adoption and Modification of Washington State Department of Ecology 2005 Stormwater Management Manual for Western Washington

Preface

The City of Bothell has selected the 2005 Washington State Department of Ecology Stormwater Management Manual for Western Washington (2005 Ecology Manual) to be the local stormwater management manual for development, redevelopment, and site improvement projects that require surface water management. This Chapter of the City of Bothell Standards and Specifications adopts the manual with the modifications identified.

Modifications have been made to better connect previous stormwater management in the City of Bothell with the 2005 Ecology Manual. The previous Chapter 4 adopted the 1998 King County Surface Water Design Manual. The shift from one manual to the other has created a situation where terminology and requirements have significantly changed. Modifications have also occurred due to language requirements and changes required by the NPDES Phase II Municipal Stormwater Permit, Appendix 1.

Lastly, modifications have been made to the 2005 Ecology Manual to coincide with Washington State Pollution Control Hearing Board (PCHB) rulings that made the application of the 2005 Ecology Manual thresholds only applicable to sites that disturb one acre or more or are less than one acre but part of a common plan of development or sale. This has brought some complexity to threshold application.

This document intends to meet or exceeds the 2005 Ecology Manual requirements, the NPDES Phase II Municipal Stormwater Permit requirements, and the requirements issued by the PCBH. The following includes modifications of the 2005 Ecology Manual as well as additional information to facilitate stormwater management in Bothell.

Volume I - Minimum Technical Requirements

Chapter 1 - Introduction

Adopted in full except for the following modification. The modification is locally adopted by this manual:

1.6.6 - NPDES and State Waste Discharge Permits for Municipalities

Washington Department of Ecology issued the NPDES Phase II Municipal Stormwater Permit to the City of Bothell January 2007, effective February 2007. The permit requires the City of Bothell to update stormwater management design standards to meet or exceed Appendix 1 of the NPDES Phase II permit. This resulted in the need for the City of Bothell to adopt the 2005 Ecology Stormwater Management Manual for Western Washington (2005 Ecology Manual).

The NPDES Phase II Municipal Stormwater Permit requires adoption of new stormwater design standards for sites that disturb one acre or more or are less than one acre but part of a larger common plan of redevelopment or sale. Accordingly, the City of Bothell has decided to adjust requirements for sites below the aforementioned threshold.

Additional changes or additions to the 2005 Ecology Manual are required to be compliant with the NPDES Phase II Municipal Stormwater Permit.

Chapter 2 - Minimum Requirements for New Development and Redevelopment

Volume I, Chapter 2, of the 2005 Ecology Manual is fully replaced by this manual.

2.1 - Relationship to Puget Sound Water Quality Management Plan

This manual, now expanded to be applicable throughout western Washington, was originally developed to comply with the 1991 Puget Sound Water Quality Management Plan. That plan (as amended in 2000) requires all counties and cities within the Puget Sound drainage basin to adopt stormwater programs which include minimum requirements for new development and redevelopment set by the Plan and in guidance developed by the Department of Ecology (Ecology). The programs are to include ordinances that address:

"... at a minimum: (1) the control of off-site water quality and quantity effects; (2) the use of best management practices for source control and treatment; (3) the effective treatment, using best management practices, of the storm size and frequency (design storm) as specified in the manual for proposed development; (4) the use of infiltration, with appropriate precautions, as the first consideration in stormwater management; (5) the protection of stream channels, fish, shellfish habitat, other aquatic habitat, and wetlands; (6) erosion and sedimentation control for new construction and redevelopment projects; and (7) local enforcement of these stormwater controls."

Ecology considers the above description to be generic to proper stormwater management in any region within the state of Washington.

Throughout this Chapter, guidance to meet the requirements of the Puget Sound Water Quality Management Plan is written in bold and supplemental guidelines that serve as advice and other materials are not in bold. To have an equivalent manual, the City of Bothell has adopted the definitions, thresholds, minimum requirements, and adjustment and variance criteria that are displayed in bold.

2.2 - Exemptions

Forest Practices:

Forest practices regulated under Title 222 WAC, except for Class IV General forest practices that are conversions from timber land to other uses, are exempt from the provisions of the minimum requirements.

Commercial agriculture:

Commercial agriculture practices involving working the land for production are generally exempt. However, the conversion from timberland to agriculture, and the construction of impervious surfaces are not exempt.

Oil and Gas Field Activities or Operations:

Construction of drilling sites, waste management pits, and access roads, as well as construction of transportation and treatment infrastructure such as pipelines natural gas treatment plants, natural gas pipeline compressor stations, and crude oil pumping stations are exempt. Operators are encouraged to implement and maintain Best Management Practices to minimize erosion and control sediment during and after construction activities to help ensure protection of surface water quality during storm events.

Road Maintenance:

The following road maintenance practices are exempt: pothole and square cut patching, overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage, shoulder grading, reshaping/regrading drainage systems, crack sealing, resurfacing with in-kind material without expanding the road prism, and vegetation maintenance.

The following road maintenance practices are considered redevelopment, and therefore are not categorically exempt. The extent to which the manual applies is explained for each circumstance.

- Removing and replacing a paved surface to base course or lower, or repairing the roadway base: If impervious surfaces are not expanded, Minimum Requirements #1 - #5 apply. However, in most cases, only Minimum Requirement #2, Construction Stormwater Pollution Prevention, will be germane. Where appropriate, project proponents are encouraged to look for opportunities to use permeable and porous pavements.
- Extending the pavement edge without increasing the size of the road prism, or paving graveled shoulders: These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for redevelopment projects are met.
- Resurfacing by upgrading from dirt to gravel, asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment ("chip seal") to asphalt or concrete: These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for redevelopment projects are met.

Underground utility projects:

Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics are only subject to Minimum Requirement #2, Construction Stormwater Pollution Prevention. Underground utility work is required to manage materials

All other new development is subject to one or more of the Minimum Requirements (see Chapter 2.4).

2.3 - Definitions Related to the Minimum Requirements

This section has been moved to the definitions section of this manual, Section 1. The definitions section includes additional definitions pertaining to the City of Bothell, specific to this manual, and should be consulted to limit interpretation by the reader.

2.4 - Application of Minimum Requirements

Not all of the Minimum Requirements apply to every development or redevelopment project. The applicability varies depending on the type and size of the project. This chapter identifies thresholds that determine the applicability of the Minimum Requirements to different projects. The flow charts in Figures 2.2 and 2.3 shall be used to determine which requirements apply. The Minimum Requirements themselves are presented in Chapter 2.5.

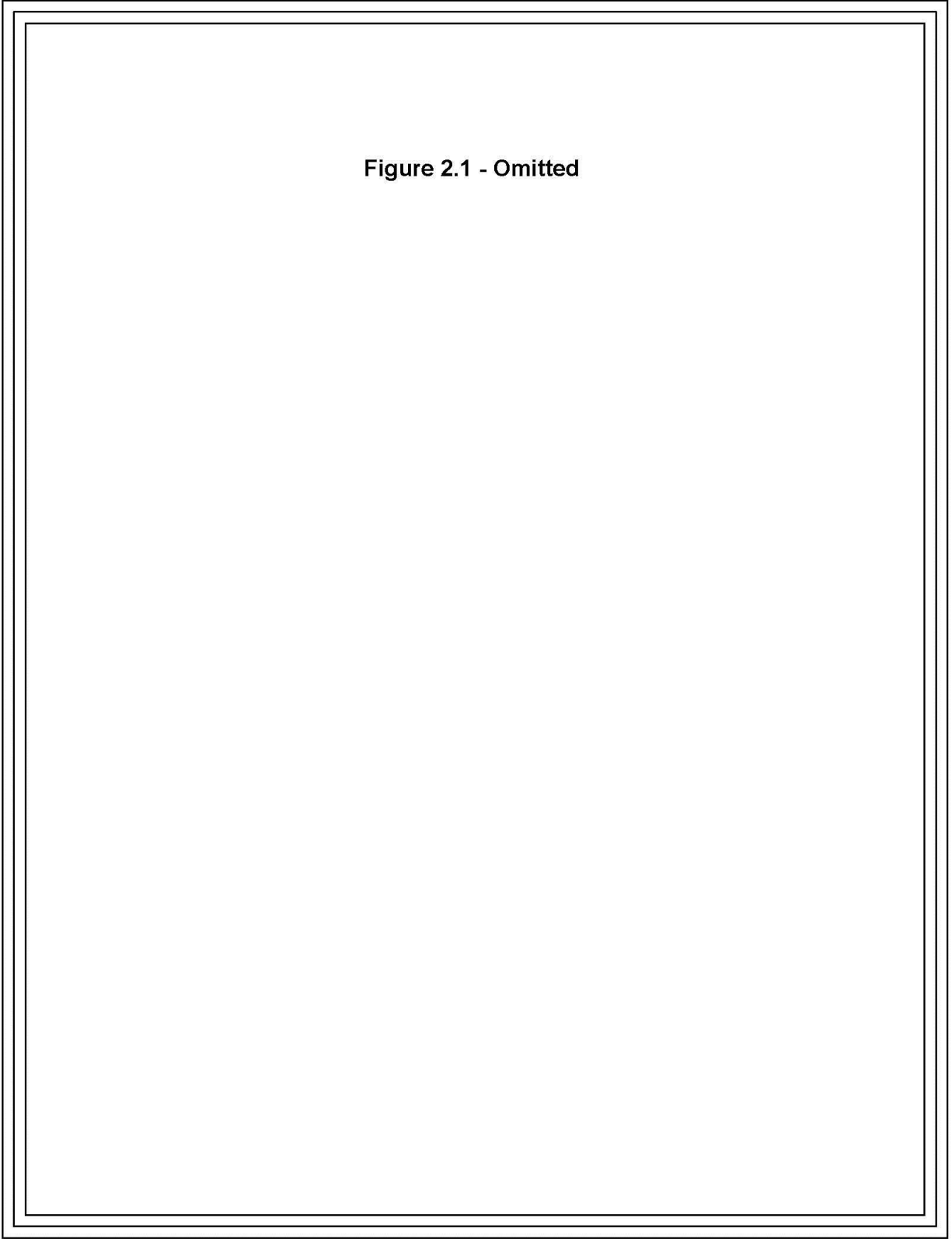


Figure 2.1 - Omitted

Figure 2.1 Omitted

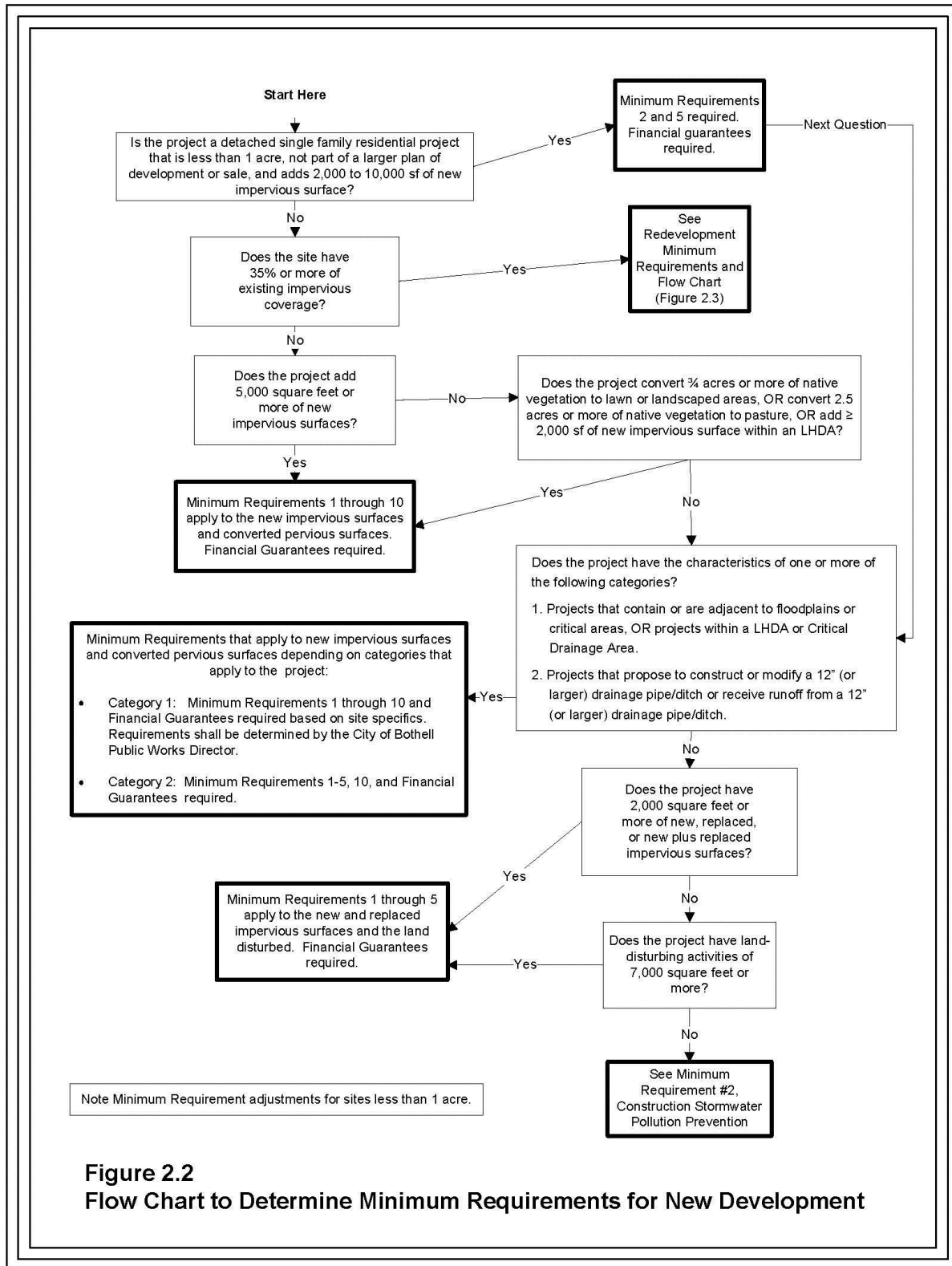


Figure 2.2 Minimum Requirements for New Development

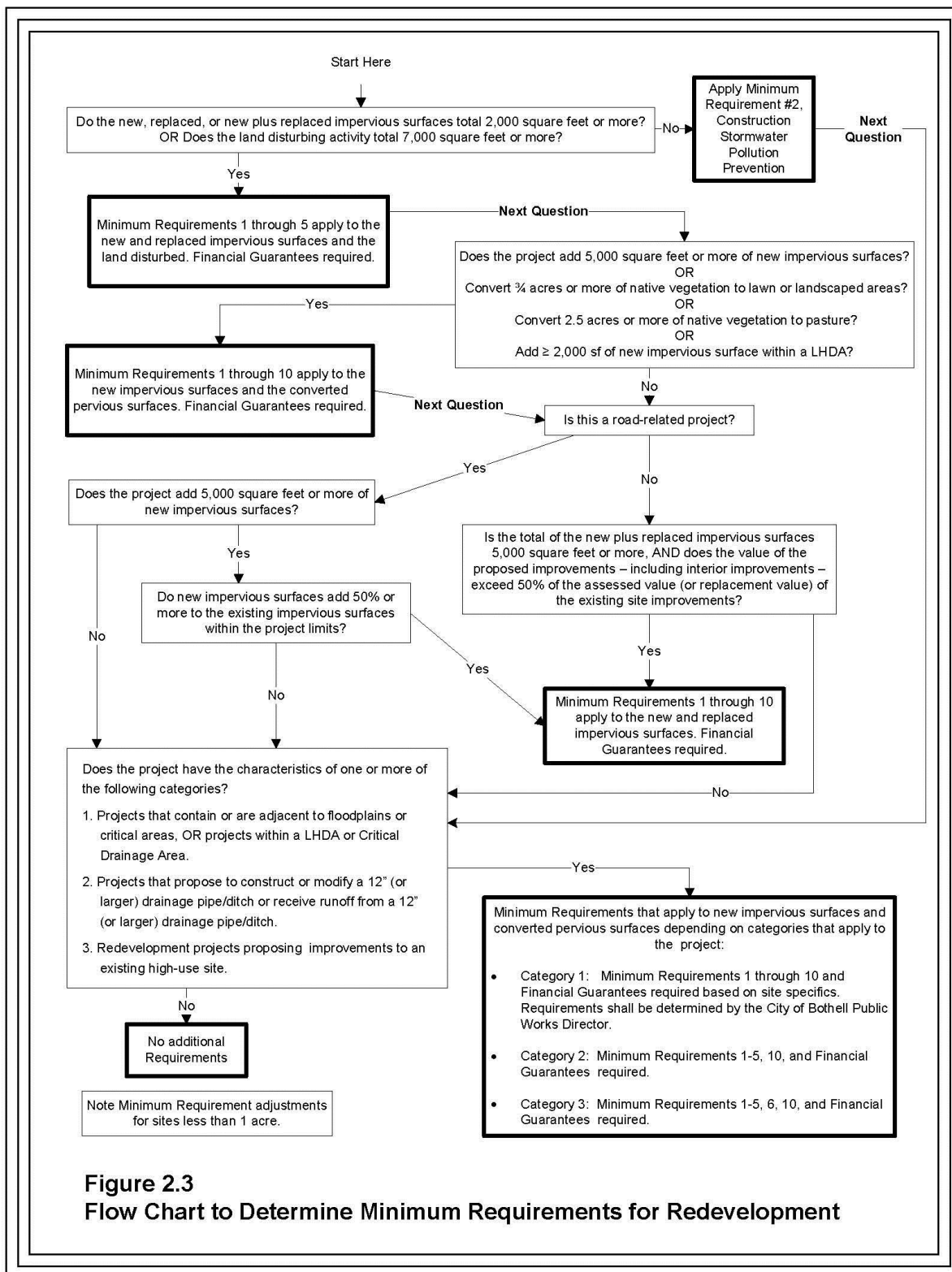


Figure 2.3 Minimum Requirements for Redevelopment.

2.4.1 - New Development

All new development shall be required to comply with Minimum Requirement 2.

Detached single family residential projects that disturb less than one acre, are not part of a larger plan of development or sale, and add 2,000 to 10,000 sf new impervious surface shall apply minimum requirements 2 and 5 to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

New development that is not detached single family residential, as described above, shall comply with Minimum Requirements 1 through 5 and provide financial guarantees for the new and replaced impervious surfaces if the project:

- **Creates or adds 2,000 square feet of new, replaced, or new plus replaced impervious surface area. OR Includes land-disturbing activities of 7,000 square feet or more.**

New development that is not detached single family residential, as described above, shall comply with Minimum Requirements 1 through 10 and provide financial guarantees for the new impervious surfaces and the converted pervious surfaces if it:

- **Creates or adds 5,000 square feet, or more, of new impervious surface area, or**
- **Converts $\frac{3}{4}$ acres, or more, of native vegetation to lawn or landscaped areas, or**
- **Converts 2.5 acres, or more, of native vegetation to pasture, OR**
- **Adds 2,000 sf or more of new impervious surfaces within an LHDA.**

Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

If a new development project of any size meets the following criteria, additional requirements may be added as follows:

- **If the site contains or is adjacent to a flood plain, critical area, or within an LHDA: all minimum requirements and financial guarantees apply to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications. Application of minimum requirements is site specific; determination of applicable minimum requirements will be determined by the City of Bothell Public Works Director.**

- If the project proposes to construct or modify, or has draining to it, a 12 inch drainage pipe/ditch, minimum requirements 1,2,3,4,5,10, and financial guarantees apply to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

Additional Guidelines

The City of Bothell may adopt basin plans. Project proponents need to verify if their site is within an adopted basin plan area and if that plan adjusts minimum requirements. Researching the application of basin planning to a specific site location is minimum requirement 9 and a required component of the site plan, minimum requirement 1. Basin plans could increase runoff treatment, flow control, and wetland protection requirements (requirements 6, 7, and 8, respectively). Inversely, basin plans could reduce minimum requirements by achieving flow control and water quality treatment requirements through regional facilities. Such facilities must be operational prior to and must have capacity for new development.

Appendix C of Volume III, of the 2005 Ecology Manual, directs users to model various low impact development techniques as landscaped area, 50% landscaped area, or pasture. Those same modeling credits may be used when summing project areas to determine whether the thresholds in Figures 2.2 and 2.3 are exceeded.

Minimum requirement 5, on-site stormwater management, requires that low impact development strategies and downspout dispersion strategies shall be considered first in stormwater management. The City of Bothell requires that project proponents consider low impact development techniques during site design and during the selection of runoff treatment and flow controls BMPs. Low impact development techniques need to adhere to design standards established in Volume V, Chapter 5 of the 2005 Ecology Manual and the current Low Impact Development Technical Guidance Manual for Puget Sound. Project proponents will be required to provide sufficient geotechnical information, per BMC 14.04, to insure the use of on-site stormwater management techniques are feasible and appropriate for the specific project and location.

Where new development projects require improvements (e.g., frontage improvements) that are not within the same threshold discharge area, the minimum requirements may be met for an equivalent (flow and pollution characteristics) area that drains to the same receiving water.

The City of Bothell may grant a variance/exception to the application of the flow control requirements for new impervious surfaces. See Bothell Municipal Code (BMC) 18.08 for requirements and procedures related to variances/exceptions for drainage.

2.4.2 - Redevelopment

All redevelopment shall be required to comply with Minimum Requirement 2.

In addition, all redevelopment that exceeds certain thresholds shall be required to comply with additional Minimum Requirements as follows.

Detached Single family residential redevelopment projects that add 2,000 to 10,000 sf new impervious surface shall apply minimum requirements 2 and 5 to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required per Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

Any redevelopment, excluding detached single family residential redevelopment projects as described above, shall apply minimum requirements 1 through 5 and provide financial guarantees for new impervious, replaced impervious, and the land disturbed if:

- The new, replaced, or new plus replaced pervious surfaces total 2,000 square feet or more.
OR
- The land disturbing activities total 7,000 square feet or more.

In addition, redevelopment projects that are not detached single family residential projects as described above, shall apply Minimum Requirements 1 through 10 and financial guarantees to the new impervious and converted pervious surfaces, if:

- The project adds 5,000 square feet or more of new impervious surfaces, OR
- Converts $\frac{3}{4}$ acres or more of native vegetation to lawn or landscaped areas, OR
- Coverts 2.5 acres or more of native vegetation to pasture, OR
- Adds 2,000 sf or more of new impervious surfaces within an LHDA.

In addition, if the project is a road-related project that adds 5,000 square feet or more of new impervious surfaces and the new impervious surfaces add 50% or more to the existing impervious surfaces within the project limits, then Minimum Requirements 1 through 10 and financial guarantees are required for the new and replaced impervious surfaces.

In addition, redevelopment projects that are not detached single family residential projects as described above, shall apply Minimum Requirements 1 through 10 and financial guarantees to the new impervious and replaced impervious surfaces, if the total of the new plus replaced impervious surfaces is 5,000 square feet or more, AND the value of the proposed improvements - including interior improvements - exceeds 50% of the assessed value (or replacement value) of the existing site improvements.

If any redevelopment project of any size meets the following criteria, additional requirements may be added as follows:

- If the site contains or is adjacent to a flood plain, critical area, or within an LHDA: all minimum requirements and financial guarantees apply to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications. Application of minimum requirements is site specific; determination of applicable minimum requirements will be determined by the City of Bothell Public Works Director.
- If the project proposes to construct or modify, or has draining to it, a 12 inch drainage pipe/ditch, minimum requirements 1,2,3,4,5,10 apply to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.
- If the project is a redevelopment project proposing improvements to an existing high-use site, minimum requirements 1, 2, 3, 4, 5, 6, 10 apply to the new impervious surfaces and converted pervious surfaces. Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

Financial guarantees shall be required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

If the runoff from the new impervious surfaces and converted pervious surfaces is not separated from runoff from other surfaces on the project site, the stormwater treatment facilities must be sized for the entire flow that is directed to them.

Minimum Requirements may be met for an equivalent (flow and pollution characteristics) area within the same site. For public roads' projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water.

Projects must retrofit the replaced impervious surfaces on the project site with flow control and water quality BMPs if the value of the proposed improvements - including interior improvements - exceeds 50% of the assessed value of the existing improvements.

Additional Guidelines

If runoff from new impervious surfaces, converted pervious surfaces, and replaced impervious surfaces (if the applicable cost or space threshold has been exceeded) is not separated from runoff from other existing surfaces within the project site or the site, the guidance in Volume III for offsite inflow shall be used to size the detention facilities.

Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics should not be subject to redevelopment requirements except construction site erosion control.

See Bothell Municipal Code (BMC) 18.08 for requirements and procedures related to variances/exceptions. For deviations from standards, see Chapter 1, section 1-8 of the City of Bothell Design and Construction Standards and Specifications.

Objective

Redevelopment projects have the same requirements as new development projects in order to minimize the impacts from new surfaces. To not discourage redevelopment projects, replaced surfaces aren't required to be brought up to new stormwater standards unless the noted cost or space thresholds are exceeded. As long as the replaced surfaces have similar pollution-generating potential, the amount of pollutants discharged shouldn't be significantly different. However, if the redevelopment project scope is sufficiently large that the cost or space criteria noted above are exceeded, it is reasonable to require the replaced surfaces to be brought up to current stormwater standards. This is consistent with other utility standards. When a structure or a property undergoes significant remodeling, the City of Bothell requires the site to be brought up to new building code requirements (e.g., on-site sewage disposal systems, fire systems).

2.5 Minimum Requirements

This chapter describes the minimum requirements for stormwater management at development and redevelopment sites. Chapter 2.4 shall be consulted to determine which requirements apply to any given project. Volumes II through V of the 2005 Ecology Manual present Best Management Practices (BMPs) for use in meeting the Minimum Requirements.

Throughout this Chapter, project proponents are required to adhere to requirements in bold font. Supplemental guidelines that serve as advice and other materials are not in bold.

2.5.1 Minimum Requirement 1: Preparation of Stormwater Site Plans

All projects meeting the thresholds in Chapter 2.4 shall prepare a Stormwater Site Plan for City of Bothell review. Stormwater Site Plans shall be prepared in accordance with Section 2, Volume I, 3.1 of this manual.

Objective

The 2005 Ecology Manual thresholds to require stormwater management were intended to trigger minimum requirements 1 through 5 for single family residential projects. The 2,000 square foot threshold for impervious surfaces and 7,000 square foot threshold for land disturbance were chosen to capture most single family home construction and their equivalent.

The City of Bothell is required by the National Pollution Discharge Elimination System (NPDES) Phase II Municipal Stormwater Permit to require the thresholds of the 2005 Ecology Manual only to sites that disturb 1 acre or more or sites less than 1 acre but part of a larger plan of development or sale. This adjusted threshold was the result of a ruling in August 2008 by The Washington State Pollution Control Hearing Board (PCHB). To be in agreement with the PCHB, the City of Bothell has adjusted requirements for sites disturbing less than 1 acre, including single family residential projects.

If the project disturbs one acre or more or is less than one acre but part of a larger common plan of development or sale, the scope of the stormwater site plan only covers compliance with Minimum Requirements #2 through #5 if the thresholds of 5,000 square feet of impervious surface or conversion of $\frac{3}{4}$ acre of native vegetation to lawn or landscape, or conversion of 2.5 acres of native vegetation to pasture are not exceeded.

Supplemental guidelines

Projects proposed by departments within the City of Bothell must comply with this requirement. The City of Bothell shall determine the process for ensuring proper project review, inspection, and compliance by its own departments and agencies.

2.5.2 Minimum Requirement 2: Construction Stormwater Pollution Prevention Plan (SWPPP).

All new development and redevelopment shall comply with Construction SWPP Elements #1 through #12 below.

Projects in which the new, replaced, or new plus replaced impervious surfaces total 2,000 square feet or more, or disturb 7,000 square feet or more of land must prepare a Construction SWPP Plan (SWPPP) as part of the Stormwater Site Plan (see 2.5.1). Each of the twelve elements must be considered and included in the Construction SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the SWPPP.

All new development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters.

Sediment and erosion control BMPs shall be consistent with the BMPs contained in Chapters 3 and 4 of Volume II of the 2005 Ecology Manual.

The SWPPP shall include a narrative and drawings. All BMP's shall be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative shall include documentation to explain and justify the pollution prevention decisions made for the project.

Projects that add or replace less than 2,000 square feet of impervious surface or disturb less than 7,000 square feet of land are not required to prepare a Construction SWPPP, but must consider all of the twelve Elements of Construction Stormwater Pollution Prevention and develop controls for all elements that pertain to the project site.

Element 1: Mark Clearing Limits

Prior to beginning land disturbing activities, including clearing and grading, all clearing limits, critical areas and their buffers, and trees that are to be preserved within the construction area shall be clearly marked, both in the field and on the plans, to prevent damage and offsite impacts. See Bothell Municipal Code (BMC) 12.18.030 for existing vegetation retention requirements.

- Plastic, metal, or stake wire fence may be used to mark the clearing limits.

The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable. If it is not practicable to retain the duff layer in place, it should be stockpiled on-site, covered to prevent erosion, and replaced immediately upon completion of the ground disturbing activities.

Element 2: Establish Construction Access

- Construction vehicle access and exit shall be limited to one route, if possible, or two for linear projects such as roadways where more than one access is necessary for large equipment maneuvering.
- Access points shall be stabilized with a pad of quarry spalls or crushed rock prior to traffic leaving the construction site to minimize the tracking of sediment onto public roads.
- Wheel wash or tire baths shall be located on site, if the stabilized construction entrance is not effective in preventing sediment from being tracked onto public roads.
- If sediment is tracked off site, public roads shall be cleaned thoroughly at the end of each day, or more frequently during wet weather, if necessary to prevent sediment from entering waters of the state. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area.
- Street washing or using water to wash sediment from streets is not allowed in the City of Bothell.

Element 3: Control Flow Rates

- Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site, as required by the City of Bothell.
- Downstream analysis is necessary if changes in flows could impair or alter conveyance systems, stream banks, bed sediment or aquatic habitat. See Chapter 3 for offsite analysis guidance.
- Where necessary to comply with Minimum Requirement #7, stormwater retention/detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces).
- The City of Bothell may require pond designs that provide additional or different stormwater flow control if necessary to address local conditions or to protect properties and waterways downstream from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site.
- If permanent infiltration ponds are used for flow control during construction, these facilities should be protected from siltation during the construction phase.

Element 4: Install Sediment Controls

- Prior to leaving a construction site, or prior to discharge to an infiltration facility, stormwater runoff from disturbed areas shall pass through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3, bullet #1. Full stabilization means concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion. The City of Bothell shall inspect and approve areas stabilized by means other than pavement or quarry spalls.

- Sediment ponds, vegetated buffer strips, sediment barriers or filters, dikes, and other BMPs intended to trap sediment on-site shall be constructed as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Earthen structures such as dams, dikes, and diversions shall be seeded and mulched according to the timing indicated in Element #5.
- BMPs intended to trap sediment on site must be located in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages, often during non-storm events, in response to rain event changes in stream elevation or wetted area.

Element 5: Stabilize Soils

- All exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrop impact and flowing water, and wind erosion.
- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This condition applies to all soils on site, whether at final grade or not. These time limits may be adjusted by the City of Bothell if it can be shown that the average time between storm events justifies a different standard.
- Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.
- Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.
- Soil stabilization measures selected should be appropriate for the time of year, site conditions, estimated duration of use, and potential water quality impacts that stabilization agents may have on downstream waters or ground water.
- Soil stockpiles must be stabilized from erosion, protected with sediment trapping measures, and when possible, be located away from storm drain inlets, waterways and drainage channels.
- Linear construction activities, including right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall be conducted to meet the soil stabilization requirement. Contractors shall install the bedding materials, roadbeds, structures, pipelines, or utilities and re-stabilize the disturbed soils so that:
- from October 1 through April 30 no soils shall remain exposed and unworked for more than 2 days; and
- from May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days.

Element 6: Protect Slopes

- Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion.
- Consider soil type and its potential for erosion.
- Off-site stormwater (run-on) shall be diverted away from slopes and disturbed areas with interceptor dikes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.
- At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion. Temporary pipe slope drains shall handle the expected peak 10-minute flow velocity from a type 1A, 10-year, 24-hour frequency storm for the developed condition. The hydrologic analysis shall use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis shall use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology model to predict flows, bare soil areas should be modeled as “landscaped area.”
- Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.
- Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.
- Check dams shall be placed at regular intervals within channels that are cut down a slope.
- Stabilize soils on slopes, as specified in Element #5.

Element 7: Protect Drain Inlets

- All storm drain inlets made operable during construction shall be protected so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.
- All approach roads shall be kept clean.
- Inlets should be inspected weekly at a minimum and daily during storm events. Inlet protection devices should be cleaned or removed and replaced when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

Element 8: Stabilize Channels and Outlets

- All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-

hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used.

- Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches shall be provided at the outlets of all conveyance systems

Element 9: Control Pollutants

- All pollutants, including waste materials and demolition debris, that occur on-site shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on site.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste). On-site fueling tanks shall include secondary containment.
- Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed on-site using temporary plastic placed beneath and, if raining, over the vehicle.
- Wheel wash or tire bath wastewater, shall be discharged to a separate on-site treatment system or to the sanitary sewer.
- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application rates and procedures shall be followed.
- BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Stormwater discharges shall not cause or contribute to a violation of the water quality standard for pH in the receiving water.
- Construction sites with significant concrete work shall adjust the pH of stormwater if necessary to prevent violations of water quality standards.
- Construction site operators shall obtain written approval from Washington Department of Ecology prior to using chemical treatment, excluding CO₂ or dry ice to adjust pH.

Element 10: Control De-Watering

- Foundation, vault, and trench de-watering water, which has similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond. Channels must be stabilized, as specified in Element #8.
- Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through a stormwater sediment pond.
- Highly turbid or otherwise contaminated dewatering water, such as from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam, shall be handled separately from stormwater.
- Other disposal options, depending on site constraints, may include: 1) infiltration, 2) transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters, 3) Ecology-approved on-site chemical treatment or other suitable treatment technologies, 4) sanitary sewer discharge with local sewer district approval, if there is no other option, or 5) use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.

Element 11: Maintain BMPs

- All temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. All maintenance and repair shall be conducted in accordance with BMP specifications.
- All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal of BMPs or vegetation shall be permanently stabilized.

Element 12: Manage the Project

- Phasing of Construction - Development projects shall be phased where feasible in order to prevent soil erosion and, to the maximum extent practicable, the transport of sediment from the site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.
- Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance/compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical areas, buffers, native growth protection easements, or tree retention areas

as required by BMC 12.18.030 , shall be delineated on the site plans and the development site.

- **Seasonal Work Limitations** - From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the City of Bothell that silt-laden runoff will be prevented from leaving the site through a combination of the following:
 1. Site conditions including existing vegetative coverage, slope, soil type and proximity to receiving waters; and
 2. Limitations on activities and the extent of disturbed areas; and
 3. Proposed erosion and sediment control measures.

Based on the information provided and/or local weather conditions, the City of Bothell may expand or restrict the seasonal limitation on site disturbance. The City of Bothell shall take enforcement action - such as a notice of violation, administrative order, penalty, or stop-work order under the following circumstances:

- If, during the course of any construction activity or soil disturbance during the seasonal limitation period, sediment leaves the construction site causing a violation of the surface water quality standard; or
- If clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained.

The following activities are exempt from the seasonal clearing and grading limitations:

1. Routine maintenance and necessary repair of erosion and sediment control BMPs;
 2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil; and
 3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.
- **Coordination with Utilities and Other Contractors** - The primary project proponent shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Construction SWPPP.
 - **Inspection and Monitoring** - All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of erosion and sediment control. The person must have the skills to 1) assess the site conditions and construction activities that could impact the quality of stormwater, and 2) assess the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

- For construction sites one acre or larger that discharge stormwater to surface waters of the state, a Certified Erosion and Sediment Control Lead shall be identified in the Construction SWPPP and shall be on-site or on-call at all times. Certification may be obtained through an approved training program that meets the erosion and sediment control training standards established by Ecology.
- Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, appropriate BMPs or design changes shall be implemented as soon as possible.
- Maintaining an Updated Construction SWPPP - The Construction SWPPP shall be retained on-site or within reasonable access to the site.

The SWPPP shall be modified whenever there is a significant change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.

The SWPPP shall be modified, if during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection.

Objective

To control erosion and prevent sediment and other pollutants from leaving the site during the construction phase of a project.

Supplemental Guidelines

If a Construction SWPPP is found to be inadequate (with respect to erosion and sediment control requirements), then the City of Bothell will require that other BMPs be implemented, as appropriate.

The City of Bothell may allow development of generic Construction SWPPP's that apply to commonly conducted public road activities, such as road surface replacement, that trigger this minimum requirement.

The City of Bothell understands that not all 12 elements are appropriate for all projects. When the project proponent considers an element and determines that the element is not applicable to the subject project, the SWPPP shall indicate "not applicable" for that element.

2.5.3 Minimum Requirement 3: Source Control of Pollution

All known, available and reasonable source control BMPs shall be applied to all projects. Source control BMPs shall be selected, designed, and maintained according to Volume IV of the 2005 Ecology Manual. Structural and operational BMPs shall be selected and detailed in the drainage site improvement plan submitted to the City of Bothell with the development permit application. Volume IV shall be used to reference minimum structural and operational BMPs to control runoff pollutants associated with future land use(s) and operations. An example would be to select source controls for trash compactors and garbage dumpster areas. The City of Bothell shall require further selection of source controls if proposed source controls are inadequate to prevent runoff pollution to the maximum extent feasible.

Objective

The intention of source control BMPs is to prevent stormwater from coming in contact with pollutants. They are a cost-effective means of reducing pollutants in stormwater, and, therefore, should be a first consideration in all projects.

Supplemental Guidelines

An adopted and implemented basin plan (Minimum Requirement #9) or a Total Maximum Daily Load (TMDL, also known as a Water Clean-up Plan) may be used to develop more stringent source control requirements that are tailored to a specific basin.

Source Control BMPs include Operational BMPs and Structural Source Control BMPs. See Volume IV for design details of these BMPs. For construction sites, see Volume II, Chapter 4 of the 2005 Ecology Manual.

Structural source control BMPs should be identified in the stormwater site plan and should be shown on site plans submitted for review.

2.5.4 Minimum Requirement 4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and down gradient properties. All outfalls require energy dissipation.

Objective

To preserve and utilize natural drainage systems to the fullest extent because of the multiple stormwater benefits these systems provide; and to prevent erosion at and downstream of the discharge location.

Supplemental Guidance

Creating new drainage patterns results in more site disturbance and more potential for erosion and sedimentation during and after construction. Creating new discharge points can create significant stream channel erosion problems as the receiving water body typically must adjust to the new flows. Diversions can cause greater impacts than would otherwise occur by discharging runoff at the natural location.

Where no conveyance system exists at the adjacent down gradient property line and the discharge was previously unconcentrated flow or significantly lower concentrated flow, then measures must be taken to prevent down gradient impacts. Drainage easements from downstream property owners may be needed and should be obtained prior to submittal of development permit application.

Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:

- A. If the 100-year peak discharge is less than or equal to 0.2 cfs under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, then the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.
- B. If the 100-year peak discharge is less than or equal to 0.5 cfs under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, then the concentrated runoff may be discharged through a dispersal trench or other dispersal system, provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.
- C. If the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, or if a significant adverse impact to down gradient properties or drainage systems is likely, then a conveyance system must be provided to convey the

concentrated runoff across the downstream properties to an acceptable discharge point (i.e., an enclosed drainage system or open drainage feature where concentrated runoff can be discharged without significant adverse impact).

Stormwater control or treatment structures shall not be located within the expected 25-year water level elevations for salmonid-bearing waters. Such areas may provide off-channel habitat for juvenile salmonids and salmonid fry. Designs for outfall systems to protect against adverse impacts from concentrated runoff are included in Volume V, Chapter 4, of the 2005 Ecology Manual. Project proponents shall refer to Bothell Shoreline Master Plan (4.13.3.8 (page 87)) for additional local requirements.

2.5.5 Minimum Requirement 5: On-site Stormwater Management

Projects shall employ On-site Stormwater Management BMPs to infiltrate, disperse, and retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. Roof Downspout Control BMPs, functionally equivalent to those described in Chapter 3 of Volume III of the 2005 Ecology Manual, and Dispersion and Soil Quality BMPs, functionally equivalent to those in Chapter 5 of Volume V of the 2005 Ecology Manual, shall be required to reduce the hydrologic disruption of developed sites.

Chapter 5 of Volume V of the 2005 Ecology Manual incorporates low impact development and references the Low Impact Development Technical Guidance Manual for Puget Sound for on-site BMP selection. The City of Bothell requires that project proponents consider on-site stormwater management before considering flow control facilities. If on-site stormwater management is not feasible, project proponents shall provide evidence justifying why on-site management techniques are not feasible. Determination of on-site stormwater management being unfeasible will be determined by the City of Bothell Public Works Director.

Objective

To use practices on individual properties to reduce the amount of disruption of the natural hydrologic characteristics of the site.

Supplemental Guidance

“Flooding and erosion impacts” include impacts such as flooding of septic systems, crawl spaces, living areas, outbuildings, etc.; increased ice or algal growth on sidewalks/roadways; earth movement/settlement, increased landslide potential; erosion and other potential damage.

Recent research indicates that current techniques in residential, commercial, and industrial land development cause gross disruption of the natural hydrologic cycle with severe impacts to water and water-related natural resources. Based upon gross level applications of continuous runoff modeling and assumptions concerning minimum flows needed to maintain beneficial uses, watersheds must retain the majority of their natural vegetation cover and soils, and developments must meet the Flow Control Minimum Requirement of this chapter, in order to avoid significant natural resource degradation in lowland streams.

The Roof Downspout Control BMPs described in Section 3.1 of Volume III of the 2005 Ecology Manual, and the Dispersion and Soil Quality BMPs in Section 5.3.1 of Volume V of the 2005 Ecology Manual are insufficient to prevent significant hydrologic disruptions and impacts to streams and their natural resources. Therefore, the City of Bothell encourages and requires additional BMPs such as those in Appendix C in Volume III and Section 5.3.1 of Volume V of the 2005 Ecology Manual.

2.5.6 Minimum Requirement 6: Runoff Treatment Thresholds

The following require construction of stormwater treatment facilities (see Table 2.1):

- Projects in which the total of effective, pollution-generating impervious surface (PGIS) is 5,000 square feet or more in a threshold discharge area of the project, or
- Projects in which the total of pollution-generating pervious surfaces (PGPS) is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or
- Sites that are less than 1 acre and category 3 in Figure 2.3, are only required to provide oil control water quality treatment. Treatment shall be required according to the treatment type thresholds defined in this section.

Table 1. Treatment requirements by threshold discharge area.

Treatment Requirements by Threshold Discharge Area		
	WQ treatment Facilities	On-site Stormwater Management and Source Control BMPs
< ¾ acres of pollution generating pervious surfaces		X
≥ ¾ acres of pollution generating pervious surfaces	X	X
< 5,000 square feet pollution generating impervious surfaces		X
≥ 5,000 square feet pollution generating impervious surfaces	X	X

PGPS = pollution-generating pervious surfaces

PGIS = pollution-generating impervious surfaces

sf = square feet

Treatment-Type Thresholds

1. Oil Control:

Treatment to achieve Oil Control applies to projects that have “high-use sites.” High-use sites are those that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. High-use sites include:

- An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area;
- An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil;

- c) An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.);
- d) A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvement.

2. Phosphorous Treatment:

The requirement to provide phosphorous control is determined by the City of Bothell (e.g., through a lake management plan), or the Department of Ecology (e.g., through a waste load allocation). The City of Bothell may develop a management plan and implementing ordinances or regulations for control of phosphorus from new/redevelopment for the receiving water(s) of the stormwater drainage. The City of Bothell can use the following sources of information for pursuing plans and implementing ordinances and/or regulations:

- a) Those water bodies reported under section 305(b) of the Clean Water Act, and designated as not supporting beneficial uses due to phosphorous;
- b) Those listed in Washington State's Nonpoint Source Assessment required under section 319(a) of the Clean Water Act due to nutrients.

3. Enhanced Treatment:

Enhanced treatment for reduction in dissolved metals is required for the following project sites that discharge to fish-bearing streams, lakes, or to waters or conveyance systems tributary to fish-bearing streams or lakes:

Industrial project sites,
Commercial project sites,
Multi-family project sites, and
High AADT roads as follows:

- Fully controlled and partially controlled limited access highways with Annual Average Daily Traffic (AADT) counts of 15,000 or more and
- All other roads with an AADT of 7,500 or greater.

However, such sites listed above that discharge directly (or, indirectly through a municipal storm sewer system) to Basic Treatment Receiving Waters (Appendix I-C of the *Stormwater Management Manual for Western Washington* (2005)), and areas of the above-listed project sites that are identified as subject to Basic Treatment requirements, are also not subject to Enhanced Treatment requirements. For developments with a mix of land use types, the Enhanced Treatment requirement shall apply when the runoff from the areas subject to the Enhanced Treatment requirement comprise 50% or more of the total runoff within a threshold discharge area.

4. Basic Treatment:

Basic Treatment generally applies to:

- Project sites that discharge to the ground, UNLESS:
 - 1) The soil suitability criteria for infiltration treatment are met; (see Chapter 3 of Volume III of the *Stormwater Management Manual for Western Washington* (2005) for soil suitability criteria) or
 - 2) The project uses infiltration strictly for flow control - not treatment - and the discharge is within ¼-mile of a phosphorus sensitive lake (use a Phosphorus Treatment facility), or within ¼ mile of a fish-bearing stream, or a lake (use an Enhanced Treatment facility).
- Residential projects not otherwise needing phosphorus control as designated by USEPA, the Department of Ecology, or by the City of Bothell;
- Project sites discharging directly to salt waters, river segments, and lakes listed in Appendix I-C of the *Stormwater Management Manual for Western Washington* (2005); and
- Landscaped areas of industrial, commercial, and multi-family project sites, and parking lots of industrial and commercial project sites that do not involve pollution-generating sources (e.g., industrial activities, customer parking, storage of erodible or leachable material, wastes or chemicals) other than parking of employees' private vehicles. For developments with a mix of land use types, the Basic Treatment requirement shall apply when the runoff from the areas subject to the Basic Treatment requirement comprise 50% or more of the total runoff within a threshold discharge

Treatment Facility Sizing

Water Quality Design Storm Volume: The volume of runoff predicted from a 24-hour storm with a 6-month return frequency (a.k.a., 6-month, 24-hour storm). Wetpool facilities are sized based upon the volume of runoff predicted through use of the Natural Resource Conservation Service curve number equations in Chapter 2, Volume III of the 2005 Ecology Manual, for the 6-month, 24-hour storm. Alternatively, the 91st percentile, 24-hour runoff volume indicated by an approved continuous runoff model may be used.

Water Quality Design Flow Rate:

- *Preceding Detention Facilities or when Detention Facilities are not required:* The flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated. Design criteria for treatment facilities are assigned to achieve the applicable performance goal at the water quality design flow rate (e.g., 80% TSS removal).
- *Downstream of Detention Facilities:* The full 2-year release rate from the detention facility.

Alternative methods can be used if they identify volumes and flow rates that are at least equivalent.

That portion of any development project in which the above PGIS or PGPS thresholds are not exceeded in a threshold discharge area shall apply On-site Stormwater Management BMPs in accordance with Minimum Requirement #5.

Treatment Facility Selection, Design, and Maintenance

Stormwater treatment facilities shall be:

- selected in accordance with the process identified in Chapter 4, Volume I of the 2005 Ecology Manual,
- designed in accordance with the design criteria in Volume V of the 2005 Ecology Manual, and
- maintained in accordance with the maintenance schedule in Volume V of the 2005 Ecology Manual.

Additional Requirements

Direct discharge of untreated stormwater from pollution-generating impervious surfaces to ground water is prohibited, except for the discharge achieved by infiltration or dispersion of runoff from residential sites through use of On-site Stormwater Management BMPs.

Objective

The purpose of runoff treatment is to reduce pollutant loads and concentrations in stormwater runoff using physical, biological, and chemical removal mechanisms so that beneficial uses of receiving waters are maintained and, where applicable, restored. When site conditions are appropriate, infiltration can potentially be the most effective BMP for runoff treatment.

Supplemental Guidelines

See Volume V of the 2005 Ecology Manual for more detailed guidance on selection, design, and maintenance of treatment facilities. The water quality design storm volume and flow rates are intended to capture and effectively treat about 90-95% of the annual runoff volume in western Washington. See Appendix I-B of Volume V of the 2005 Ecology Manual for background on their derivation.

Volume V of the 2005 Ecology Manual includes performance goals for Basic, Enhanced, Phosphorus, and Oil Control treatment, and a menu of facility options for each treatment type. Treatment facilities that are selected from the appropriate menu and designed in accordance with their design criteria are presumed to meet the applicable performance goals.

An adopted and implemented basin plan (Minimum Requirement #9), or a Total Maximum Daily Load (TMDL - also known as a Water Clean-up Plan) may be used to develop runoff treatment requirements that are tailored to a specific basin. However, treatment requirements shall not be less than that achieved by facilities in the Basic Treatment Menu (see Volume V, Chapter 3, of the 2005 Ecology Manual).

Treatment facilities applied consistent with this manual are presumed to meet the requirement of state law to provide all known available and reasonable methods of treatment (RCW 90.52.040, RCW 90.48.010). This technology-based treatment requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality

standards, Chapter 173-201A WAC; state ground water quality standards, Chapter 173-200 WAC; state sediment management standards, Chapter 173-204 WAC; and the underground injection control program, Chapter 173-218 WAC. Additional treatment to meet those standards may be required by federal, state, or local governments.

Infiltration through use of On-site Stormwater Management BMPs can provide both treatment of stormwater, through the ability of certain soils to remove pollutants, and volume control of stormwater, by decreasing the amount of water that runs off to surface water. Infiltration through engineered treatment facilities that utilize the natural soil profile can also be very effective at treating stormwater runoff, but pretreatment must be applied and soil conditions must be appropriate to achieve effective treatment while not impacting ground water resources. See Chapter 6, Volume V of the 2005 Ecology Manual for design details.

Discharge of pollution-generating surfaces into a dry well, after pretreatment for solids reduction, can be acceptable if the soil conditions provide sufficient treatment capacity. Dry wells into gravelly soils are not likely to have sufficient treatment capability. They must be preceded by at least a basic treatment BMP. See Volume V, Chapters 2 and 7 of the 2005 Ecology Manual for details.

Impervious surfaces that are “fully dispersed” in accordance with BMP T5.30 in Volume V of the 2005 Ecology Manual are not considered effective impervious surfaces. PGIS surfaces that are “dispersed” in accordance with the BMPs in Section 5.1 of Volume V of the 2005 Ecology Manual are considered effective impervious surfaces. Porous pavers and Modular grid pavements are assigned a lower curve number (if using single event hydrology to size wetpools) and lower surface runoff calibrations (if using continuous runoff modeling). See Volume III of the 2005 Ecology Manual for a more complete description of hydrologic credits for On-site Stormwater Management BMPs.

2.5.7 Minimum Requirement 7: Flow Control

Applicability

Projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly, or indirectly through a conveyance system, into a fresh water - except for projects that discharge to the Sammamish River in accordance with the following restrictions:

- Direct discharge to the Sammamish River does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types “S”, “F”, or “Np” in the Permanent Water Typing System, or from any category I, II, III or IV wetland (refer to BMC 14.04 for wetland definitions); and
- Flow splitting devices or drainage BMP’s are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland:
 - Design of flow splitting devices or drainage BMP’s will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.
 - Flow splitting devices or drainage BMP’s that deliver flow to category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions (BMC 14.04); and
- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and
- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the full zoning build-out condition from non-project areas from which runoff is or will be collected; and
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, this requirement, requirements in BMC 14.04, and Minimum Requirement 8 apply.

The City of Bothell may petition Ecology to exempt projects in additional areas. A petition must justify the proposed exemption based upon a hydrologic analysis that demonstrates that the potential stormwater runoff from the exempted area will not significantly increase the erosion forces on the stream channel nor have near field impacts as required by BMC 14.04.

Thresholds

The following require construction of flow control facilities and/or land use management BMPs that will achieve the standard requirements for western Washington (see Tables 2.1, 2.2, and 2.3):

- Project disturbing less than 1 acre but not part of a larger common plan of development or sale, not within a landslide hazard drainage area (LHDA), that add 10,000 sf or more of effective impervious surface within a threshold discharge area, or
- Projects disturbing more than one acre or less than 1 acre but part of a larger common plan of development or sale, in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or
- Projects that add 2,000 sf or more of effective impervious surface to a threshold discharge area within a LHDA, or
- Projects that convert $\frac{3}{4}$ acres or more of native vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or
- Projects that through a combination of effective impervious surfaces and converted pervious surfaces cause a 0.1 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model.

That portion of any development project in which the above thresholds are not exceeded in a threshold discharge area shall apply On-site Stormwater Management BMPs in accordance with Minimum Requirement #5.

Table 2. Flow control requirements by threshold discharge area.

Flow Control Requirements by Threshold Discharge Area		
	Flow Control Facilities	On-site Stormwater Management BMPs
< $\frac{3}{4}$ acres conversion to lawn/landscape, or < 2.5 acres to pasture		X
$\geq \frac{3}{4}$ acres conversion to lawn/landscape, or > 2.5 acres to pasture	X	X
< 10,000 square feet of effective impervious area		X
\geq 10,000 square feet of effective impervious area	X	X
\geq 0.1 cubic feet per second increase in the 100-year flood frequency	X	X

Standard Requirement

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover unless:

- 1) the site disturbs less than 1 acre, and is not part of a larger common plan of development or sale, than the pre-development condition to be matched shall be the existing land cover.
- 2) reasonable, historic information is provided that indicates the site was prairie prior to settlement (modeled as “pasture” in the Western Washington Hydrology Model); or,
- 3) the drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area since 1985. In this case, the pre-developed condition to be matched shall be the existing land cover condition. Where basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the pre-developed condition assumption shall be the “historic” land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an approved basin study.

This standard requirement is waived for sites that will reliably infiltrate all the runoff from impervious surfaces and converted pervious surfaces.

Alternative Requirement

An alternative requirement may be established through application of watershed-scale hydrological modeling and supporting field observations. Flow control alternatives are not currently established in Bothell but may be in the future. Possible reasons for an alternative flow control requirement include:

- Establishment of a stream-specific threshold of significant bedload movement other than the assumed 50% of the 2-year peak flow;
- Zoning and Land Clearing Ordinance restrictions that, in combination with an alternative flow control standard, maintain or reduce the naturally occurring erosive forces on the stream channel; or
- A duration control standard is not necessary for protection, maintenance, or restoration of designated beneficial uses or Clean Water Act compliance.

Additional Requirement

Flow Control facilities shall be selected, designed, and maintained according to this manual and the 2005 Ecology Manual. On-site stormwater Management BMPs shall be selected, designed, and maintained in accordance with this manual and the 2005 Ecology Manual.

Objective

To prevent increases in the stream channel erosion rates that are characteristic of natural conditions (i.e., prior to disturbance by European settlement). The standard intends to maintain the total amount of time that a receiving stream exceeds an erosion-causing threshold based upon historic rainfall and natural land cover conditions. That threshold is assumed to be 50% of the 2-year peak flow. Maintaining the naturally occurring erosion rates within streams is vital, though by itself insufficient, to protect fish habitat and production.

Supplemental Guidelines

Reduction of flows through infiltration decreases stream channel erosion and helps to maintain base flow throughout the summer months. However, infiltration should only be used where ground water quality is not threatened by such discharges.

Volume III includes a description of the Western Washington Hydrology Model. The model provides credits for use of certain On-site Stormwater Management BMPs described in Volume V, and other low impact development techniques described in Appendix C of Volume III of the 2005 Ecology Manual. Using those BMPs and LID techniques reduces the size of the required flow control facilities.

Application of sufficient types of On-site Stormwater Management BMPs can result in reducing the effective impervious area and the converted pervious areas such that a flow control facility is not required. Application of “Full Dispersion”, BMP T5.30, also results in eliminating the flow control facility requirement for those areas that are “fully dispersed.”

See the supplemental guidelines for Minimum Requirement #8 and directions concerning use of the Western Washington Hydrology Model for information about tracking wetland hydrologic conditions.

Diversions of flow from perennial streams and from wetlands can be considered if significant existing (i.e., pre-project) flooding, stream stability, water quality, or aquatic habitat problems would be solved or significantly mitigated by bypassing stormwater runoff rather than providing stormwater detention and discharge to natural drainage features. Bypassing should not be considered as an alternative to applicable flow control or treatment if the flooding, stream stability, water quality or habitat problem to be solved would be caused by the project. In addition, the proposal should not exacerbate other water quality/quantity problems such as inadequate low flows or inadequate wetland water elevations. In all instances, the diversion of flow shall be consistent with BMC 14.04.

The existing problems and their solution or mitigation as a result of the direct discharge should be documented by a stormwater engineer AND biological scientist after review of any available drainage reports, basin plans, critical area reports, special studies, or other relevant literature. The restrictions in this minimum requirement on conveyance systems that transfer water to an exempt receiving water are applicable in these situations. Approvals from all regulatory authorities with relevant permits applicable to the project are required.

The Department of Ecology has published a listing of 20-year/40% Total Impervious Areas (TIA) in Western Washington. Listings were developed from satellite images taken in 1990, 1995, and 2000. No area within the City of Bothell was identified by Washington Department of Ecology as qualifying for the 20 year/40% TIA exemption. The 1991 Criterion TIA map and additional mapping data can be found at:

<http://www.ecy.wa.gov/services/gis/data/impervious/basins.htm>.

The City of Bothell can use these and local information sources to identify basins that meet the 40% TIA/20 year criterion. Basin plans will be created or updated with 40% TIA/20 year criterion as such plans, and associated basin studies, are feasible. The application of the 40% TIA/20-year criterion will be determined by the City of Bothell and not by project proponents.

The Dept. of Ecology hopes to publish guidance concerning basin studies to develop basin-specific flow control strategies intended to stabilize stream channels and provide flows intended to protect and restore beneficial uses such as fish resources. Until such guidance is published, the reader can review procedures used in the Des Moines Creek basin plan. The recommendations made in basin plans should be consistent with the requirements and intent of the federal Clean Water Act, the State Water Pollution Control Act, and any other applicable natural resources statutes, such as the Federal Endangered Species Act.

2.5.8 Minimum Requirement 8: Wetland Protection

Applicability

The requirements below apply only to projects whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system. These requirements must be met in addition to meeting Minimum Requirement #6, Runoff Treatment. Project proponents are also required to comply with Bothell Municipal Code 14.04 to protect wetlands.

Thresholds

The thresholds identified in Minimum Requirement #6 - Runoff Treatment, and Minimum Requirement #7 - Flow Control shall also be applied for discharges to wetlands.

Standard Requirement

Discharges to wetlands shall maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses. The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions unless directed otherwise by a regulatory agency with jurisdiction. A wetland can be considered for hydrologic modification and/or stormwater treatment in accordance with Guide Sheet 1B in Appendix I-D of the 2005 Ecology Manual.

Additional Requirements

The standard requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality standards, Chapter 173-201A WAC, or state ground water standards, Chapter 173-200 WAC. Additional treatment requirements to meet those standards may be required by federal, state, or the City of Bothell.

Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer. Conveyance may be built within a vegetated buffer in compliance with BMC 14.04.

An adopted and implemented basin plan (Minimum Requirement #9), or a Total Maximum Daily Load (TMDL, also known as a Water Clean-up Plan) may be used to develop requirements for wetlands that are tailored to a specific basin.

Objective

To ensure that wetlands receive the same level of protection as any other waters of the state. Wetlands are extremely important natural resources which provide multiple stormwater benefits, including ground water recharge, flood control, and stream channel erosion protection. They are easily impacted by development unless careful planning and management are conducted. Wetlands can be severely degraded by stormwater discharges from urban development due to pollutants in the runoff and also due to disruption of natural hydrologic functioning of the wetland system. Changes in water levels and the frequency and duration of inundations are of particular concern.

2.5.9 Minimum Requirement 9: Basin/Watershed Planning

Projects may be subject to equivalent or more stringent minimum requirements for erosion control, source control, treatment, and operation and maintenance, and alternative requirements for flow control and wetlands hydrologic control as identified in Basin/Watershed Plans. Basin/Watershed plans shall evaluate and include, as necessary, retrofitting urban stormwater BMPs into existing development and/or redevelopment in order to achieve watershed-wide pollutant reduction and flow control goals that are consistent with requirements of the federal Clean Water Act. Standards developed from basin plans shall not modify any of the above minimum requirements until the basin plan is formally adopted and implemented by the City of Bothell within the basin, and approved or concurred with by Ecology.

Objective

To promote watershed-based planning as a means to develop and implement comprehensive, water quality protection measures. Primary objectives of basin planning are to reduce pollutant loads and hydrologic impacts to surface and ground waters in order to protect beneficial uses.

Supplemental Guidelines

Though Minimum Requirements #1 through #8 establish general standards for individual sites, they do not evaluate the overall pollution impacts and protection opportunities that could exist at the watershed level. In order for a basin plan to serve as a means of modifying the minimum requirements the following conditions must be met:

- the plan must be formally adopted by all jurisdictions with responsibilities under the plan and
- all ordinances or regulations called for by the plan must be in effect.

This is what is meant by an adopted and implemented basin plan.

Basin planning provides a mechanism by which the minimum requirements and implementing BMP's can be evaluated and refined based on an analysis of an entire watershed. Basin plans are especially well suited to develop control strategies to address impacts from future development and to correct specific problems whose sources are known or suspected. Basin plans can be effective at addressing both long-term cumulative impacts of pollutant loads and short-term acute impacts of pollutant concentrations, as well as hydrologic impacts to streams, wetlands, and ground water resources. The USGS has developed software called "GenScn" (Generation and Analysis of Model Simulation Scenarios) that can facilitate basin planning. The program is a Windows-based use of HSPF that predicts water quality and quantity changes for multiple scenarios of land use and water management within a basin.

Examples of how Basin Planning can alter the minimum requirements of this manual are given in Appendix I-A of the 2005 Ecology Manual.

2.5.10 Minimum Requirement 10: Operation and Maintenance

An operation and maintenance manual that is consistent with the provisions in Volume V of the 2005 Ecology Manual shall be provided for all proposed stormwater facilities and BMPs, and the party (or parties) responsible for maintenance and operation shall be identified. At private facilities, a copy of the manual shall be retained on-site or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the manual shall be retained in the appropriate department of the City.

A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the City of Bothell. The log shall include the dates maintenance occurred, the extent of the maintenance, the name of the company providing maintenance, and the name/address of the disposal site where maintenance waste was disposed of.

Objective

To ensure that stormwater control facilities are adequately maintained and operated properly.

Supplemental Guidelines

Inadequate maintenance is a common cause of failure for stormwater control facilities. The description of each BMP in Volumes II, III, and V of the 2005 Ecology Manual includes a section on maintenance. Chapter 4 of Volume V of the 2005 Ecology Manual includes a schedule of maintenance standards for drainage facilities.

2.6 Additional Requirements

2.6.1 Financial Guarantees

All drainage facilities constructed or modified for projects (except downspout infiltration and dispersion systems), and any work performed in the right-of-way, must comply with the financial guarantees requirements in Chapter 1, section 1-5 of the City of Bothell Design and Construction Standards and Specifications. Refer to Chapter 1 for performance and maintenance bond requirements.

2.6.2 Offsite Analysis and Mitigation

Development projects that discharge stormwater offsite shall submit an offsite analysis report that assesses the potential off-site water quality, erosion, slope stability, and drainage impacts associated with the project and that proposes appropriate mitigation of those impacts.

An initial qualitative analysis shall extend downstream for the entire flow path from the project site to the receiving water or up to one mile, whichever is less. If a receiving water is within one-quarter mile, the analysis shall extend within the receiving water to one-quarter mile from the project site.

The analysis shall extend one-quarter mile beyond any improvements proposed as mitigation. The analysis must extend upstream to a point where any backwater effects created by the project cease. Upon review of the qualitative analysis, the City of Bothell may require that a quantitative analysis be performed.

The existing or potential impacts to be evaluated and mitigated shall include:

- Conveyance system capacity problems;
- Localized flooding;
- Upland erosion impacts, including landslide hazards;
- Stream channel erosion at the outfall location;
- Violations of surface water quality standards as identified in a Basin Plan or a TMDL (Water Clean-up Plan); or violations of ground water standards in a wellhead protection area.

Objective

To identify and evaluate offsite water quality, erosion, slope stability, and drainage impacts that may be caused or aggravated by a proposed project, and to determine measures for preventing impacts and for not aggravating existing impacts. Aggravated shall mean increasing the frequency of occurrence and/or severity of a problem.

Supplemental Guidelines

Some of the most common and potentially destructive impacts of land development are erosion of downgradient properties, localized flooding, and slope failures. These are caused by increased surface water volumes and changed runoff patterns.

Projects shall be required to initially submit, with the permit application, a qualitative analysis of each downstream system leaving a site. The analysis shall accomplish four tasks:

Task 1 - Define and map the study area

(1) a site map showing property lines, and (2) the best available topographical map (e.g., from the Bothell Department of Public Works, Sewer District, or at a minimum a USGS 1:24000 Quadrangle Topographic map) with the study area boundaries, site boundaries, downstream flowpath, and potential/existing problems (Task 4) shown. Other maps, diagrams, and photographs such as aerial photos may be helpful in describing the study area.

Task 2 - Review all available information on the study area

To assist the design engineer in preparing an offsite analysis, Bothell has gathered information regarding existing and potential flooding and erosion problems. For all levels of analysis, all of the resources described below shall be reviewed for existing/potential problems in the study area (upstream and one mile downstream of the project site):

- Adopted basin plans (available at the Bothell Department of Public Works)
- Finalized drainage studies (available at the Bothell Department of Public Works)
- Basin Reconnaissance Summary Reports and 1"=400's scale problem summary maps (available at the Bothell Department of Public Works)
- Floodplain/floodway (FEMA) maps (available at the Bothell Department of Public Works)
- Other offsite analysis reports in the same subbasin, if available (check with the Bothell Department of Public Works records staff)
- Critical Areas Map (available from the Bothell Community Development Department must be used to document the distance downstream from proposed project to nearest critical areas identified on the map). Maps are also available from the City of Bothell website (www.ci.bothell.wa.us.)
- Road drainage problems (check with the City of Bothell Public Works Maintenance Dept.)
- U.S. Department of Agriculture, *King County* Soils Survey (available at the Bothell Department of Public Works)
- Wetlands Inventory maps (available from the Bothell Community Development Department, also online at www.ci.bothell.wa.us)

Potential/existing problems identified in the above documents shall be documented. If a document is not available for the site, note in the report that the information was not available as of a particular date. If necessary, additional resources are available from the City of Bothell, the Washington State Department of Fisheries and Wildlife (DFW), the State Department of Ecology (DOE), the United States Army Corps of Engineers (Corps), and the Public Works departments of other municipalities in the vicinity of the proposed project site.

Task 3 - Field inspect the study area

The design engineer should physically inspect the existing on- and off-site drainage systems of the study area for each discharge location for existing or potential problems and drainage features. An initial inspection and investigation should include:

- Investigate problems reported or observed during the resource review

- Locate existing/potential constrictions or capacity deficiencies in the drainage system
- Identify existing/potential flooding problems
- Identify existing/potential overtopping, scouring, bank sloughing, or sedimentation
- Identify significant destruction of aquatic habitat (e.g., siltation, stream incision)
- Collect qualitative data on features such as land use, impervious surface, topography, soils, presence of streams, wetlands
- Collect information on pipe sizes, channel characteristics, drainage structures
- Verify tributary drainage areas identified in task 1
- Contact the City of Bothell Public Works Department, neighboring property owners, and residents about drainage problems
- Note date and weather at time of inspection

Task 4 - Describe the drainage system, and its existing and predicted problems

For each drainage system component (e.g., pipe, culvert, bridges, outfalls, ponds, vaults) the following will be covered in the analysis: location, physical description, problems, and field observations.

All existing or potential problems (e.g., ponding water, erosion) identified in tasks 2 and 3 above shall be described. The descriptions shall be used to determine whether adequate mitigation can be identified, or whether more detailed quantitative analysis is necessary. The following information should be provided for each existing or potential problem:

- Magnitude of or damage caused by the problem
- General frequency and duration
- Return frequency of storm or flow when the problem occurs (may require quantitative analysis)
- Water elevation when the problem occurs
- Names and concerns of parties involved
- Current mitigation of the problem
- Possible cause of the problem
- Whether the project is likely to aggravate the problem or create a new one.

Upon review of this analysis, the City of Bothell may require mitigation measures deemed adequate for the problems, or a quantitative analysis, depending upon the presence of existing or predicted flooding, erosion, or water quality problems, and on the proposed design of the on-site drainage facilities. The analysis should repeat tasks 3 and 4 above, using quantitative field data including profiles and cross-sections.

The quantitative analysis shall provide information on the severity and frequency of an existing problem or the likelihood of creating a new problem. It shall evaluate proposed mitigation intended to avoid aggravation of the existing problem and to avoid creation of a new problem.

Downstream Problems Requiring Special Attention

While the flow controls serve to minimize the creation and aggravation of many types of downstream drainage problems, there are some types that are more sensitive to aggravation than

others depending on the nature or severity of the problem. In particular, there are four types of downstream problems where the City has determined that the nature and/or severity of the problem warrants additional attention through the downstream analysis and possibly additional mitigation to ensure no aggravation:

- Conveyance system nuisance problems.
- Severe erosion problems.
- Severe flooding problems.
- Impacts upon critical areas (i.e. wetlands, fish habitat and passage, streams)

Conveyance system nuisance problems are minor but chronic flooding or erosion problems that result from the overflow of a constructed conveyance system that is substandard or has become too small due to upstream development, see definition below. Such problems warrant additional attention because of their chronic nature and because they result from the failure of a conveyance system to provide a minimum acceptable level of protection. Severe flooding and erosion problems as defined below also warrant additional attention because they either pose a significant threat to health and safety or can cause significant damage to public or private property.

Conveyance System Nuisance Problems

Nuisance problems in general are defined as any existing or predicted flooding or erosion that does not constitute a severe flooding or erosion problem as defined below. Conveyance system nuisance problems are defined as any nuisance flooding or erosion that results from the overflow of a constructed conveyance system for runoff events less than or equal to a 10-year event. Examples include inundation of a shoulder or lane of a roadway, overflows collecting in yards or pastures, shallow flows across driveways, minor flooding of crawl spaces or unheated garages/outbuildings, and minor erosion.

If a conveyance system nuisance problem is identified or predicted downstream, the need for additional mitigation must be evaluated as specified in “Problem-Specific Mitigation Requirements” below. This may entail additional on-site flow control or other measures as needed to prevent creation or significant aggravation of the problem.

For any other nuisance problem, which may be identified downstream, this manual does not require mitigation beyond the flow control minimum requirements. This is because to prevent aggravation of such problems (e.g., those caused by the elevated water surfaces of ponds, lakes, wetlands, and closed depressions or those involving downstream erosion) can require two to three times as much on-site detention volume, which is considered unwarranted for addressing nuisance problems. However, if under some unusual circumstance, the aggravation of such a nuisance problem is determined by Public Works to be a significant adverse impact, additional mitigation may be required, through the State of Washington Environmental Policy Act.

Severe Erosion Problems

Severe erosion problems are defined as downstream channels, ravines, or slopes with evidence of or potential for erosion/incision sufficient to pose a sedimentation hazard to downstream conveyance systems or pose a landslide hazard by undercutting adjacent slopes. Severe erosion problems do not include roadway shoulder rilling or minor ditch erosion.

If a severe erosion problem is identified or predicted downstream, additional mitigation must be considered. This may entail additional on-site flow control or other measures as needed to prevent creation or aggravation of the problem.

Severe Flooding Problems

Severe flooding problems can be caused by conveyance system overflows or the elevated water surfaces of ponds, lakes, wetlands, or closed depressions. Severe flooding problems are defined as follows:

Flooding of the finished area of a habitable building, or the electrical/heating , system of a habitable building for runoff events less than or equal to a 100-year event. Examples include flooding of finished floors of homes and commercial or industrial buildings, or flooding of electrical heating system components in the crawl space or garage of a home. Such problems are referred to in this manual as “severe building flooding problems.”

Flooding over all lanes of a roadway or severely impacting a sole access driveway for runoff events less than or equal to the 100-year event. Such problems are referred to in this manual as “severe roadway flooding problems.”

If a severe flooding problem is identified or predicted downstream, the need for additional mitigation must be evaluated. This may entail consideration of additional on-site flow control or other measures as needed to prevent creation or significant aggravation of the problem.

Impact Mitigation

A proposed project must not significantly aggravate existing downstream problems or create new problems as a result of developing the site. This manual does not require development proposals to fix or otherwise reduce the severity of existing downstream drainage problems, although doing so may be an acceptable mitigation.

Principles of Impact

Aggravation of an existing downstream problem means increasing the frequency of occurrence and/or severity of the problem. Increasing peak flows at the site of a problem caused by conveyance system overflows can increase the frequency of the problem’s occurrence. Increasing durations of flows at or above the overflow return frequency can increase the severity of the problem by increasing the depth and duration of flooding. Controlling peaks and durations through on-site detention can prevent aggravation of such problems by releasing the increased volumes due to development only at return frequencies below the conveyance overflow return frequency, with the net result of causing the conveyance system to flow full for a longer period of time.

When a problem is caused by high water-surface elevations of a volume-sensitive water body, such as a lake, wetland, or closed depression, aggravation means the same as for problems caused by conveyance overflows. Increasing the volume of flows to a volume-sensitive water body can increase the frequency of the problem’s occurrence. Increasing the duration of flows for a

range of return frequencies both above and below the problem return frequency can increase the severity of the problem; mitigating these impacts requires control of flow durations for a range of return frequencies both above and below the problem return frequency. The net effect of this duration control is to release the increased volumes due to development only at water surface elevations below that causing the problem, which in turn can cause an increase in these lower, but more frequently occurring, water surface elevations. This underscores an unavoidable impact of development upstream of volume-sensitive water bodies: the increased volumes generated by the development will cause some range of increase in water surface elevations, no matter what detention standard is applied.

Creating a new problem means increasing peak flows and/or volumes such that after development, the frequency of conveyance overflows or water surface elevations exceeds the thresholds for the various problem types discussed.

The potential for causing a new problem is often identified during the qualitative offsite analysis, where the observation of a reduction in downstream pipe sizes, for example, may be enough to predict creation of a new problem. A quantitative offsite analysis will typically be required to verify the capacity of the system and determine whether 100-year flows can be safely conveyed.

Significance of impacts to Existing Problems

The determination of whether additional on-site mitigation or other measures are needed to address an existing downstream problem depends on the significance of the proposed project's predicted impact on that problem. For some identified problems, Public Works will make the determination as to whether the project's impact is significant enough to require additional mitigation.

For conveyance system nuisance problems, the problem is considered significantly aggravated if there is any increase in the project's contribution to the frequency of occurrence and/or severity of the problem for runoff events less than or equal to the 10-year event. Note: Increases in the project's contribution to this type of problem are considered to be prevented if sufficient on-site flow control and/or offsite improvements are provided.

For severe erosion problems, the problem is considered significantly aggravated if there is any increase in project's contribution to the flow duration of peak flows ranging from 50% of the 2-year peak flow up to the full 50-year peak flow at the eroded area.

For severe building flooding problems, the problem is considered significantly aggravated if there is any increase in the project's contribution to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event.

For severe roadway flooding problems, the problem is considered significantly aggravated if any of the following thresholds are exceeded and there is any increase in the project's contribution to the frequency, depth, and/or duration of the problem for runoff events less than or equal to the 100-year event:

The existing flooding over all lanes of a roadway or overtopping the culverted section of a “sole access driveway” is predicted to increase in depth more than a quarter-inch or 10% (whichever is greater) for the 100-year runoff event.

The “existing flooding” over all lanes of a roadway or “severely impacting a sole access driveway” is more than 6 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event.

The “existing flooding” over all lanes of a sole access roadway is more than 3 inches deep or faster than 5 feet per second for runoff events less than or equal to the 100-year event, or is at any depth for runoff events less than or equal to the 10-year event.

Problem Specific Mitigation Requirements

IF a proposed project or threshold discharge area within a project drains to one or more of the three types of downstream drainage problems as identified through an offsite analysis, THEN the applicant must do one of the following:

- Submit a quantitative downstream analysis demonstrating that the proposed project will not create or significantly aggravate the identified downstream problem(s), OR
- Document that the flow control standard required is adequate to prevent creation or significant aggravation of the identified downstream problem(s) OR
- Provide additional on-site flow control necessary to prevent creation or significant aggravation of the downstream problem(s).
- Provide offsite improvements necessary to prevent creation or significant aggravation of the identified downstream problem(s)

OR

- Provide a combination of additional on-site flow control and offsite improvements sufficient to prevent creation or significant aggravation of the downstream problem(s) as demonstrated by a quantitative offsite analysis.

IF it is identified that the manner of discharge from a proposed project may create a significant adverse impact as described in Minimum Requirement 4, THEN Public Works may require the applicant to implement additional measures or demonstrate the impact will not occur.

Objective

To ensure provisions are made (if necessary) to prevent creation or significant aggravation of the three types of downstream problems requiring special attention by this manual, and to ensure compliance with the discharge requirements of Minimum Requirement 4.

In addressing downstream problems per Problem-Specific Mitigation Requirement above, the easiest of the provisions to implement will often be that of additional on-site flow control. This involves designing the required on-site flow control facility to meet an additional set of performance criteria targeted to prevent significant aggravation of specific downstream problems.

Note that in some cases the minimum flow control standard applicable to the proposed project is already sufficient to prevent significant aggravation of many of the defined downstream problem types.

2.7 Adjustments

Adjustments to the Minimum Requirements may be granted prior to permit approval and construction. The City of Bothell may grant an adjustment. Refer to BMC 18.02.040 Permissible Alternatives to Bothell Standards for requirements and procedures to request adjustments.

2.8 Exceptions/Variations

Exceptions/variances (exceptions) to the Minimum Requirements may be granted by the City of Bothell. Refer to Bothell Municipal Code (BMC) 18.08 for information.

Chapter 3 - Preparation of Stormwater Site Plans

The Stormwater Site Plan is the comprehensive report containing all of the technical information and analysis necessary for the City of Bothell to evaluate a proposed new development or redevelopment project for compliance with stormwater requirements. Contents of the Stormwater Site Plan will vary with the type and size of the project, and individual site characteristics.

The scope of the Stormwater Site Plan also varies depending on the applicability of Minimum Requirements (section 2, volume I, 2.4 of this manual).

This chapter describes the contents of a Stormwater Site Plan and provides a general procedure for how to prepare the plan. The specific BMPs and design methods and standards to be used are contained in Volumes II-V of the 2005 Ecology Manual. The content of, and the procedures for preparing a Construction Stormwater Pollution Prevention Plan (SWPPP) are covered in detail in Chapter 3 of Volume II of the 2005 Ecology Manual. Guidelines for selecting BMPs are given in Chapter 4, Volume I of the 2005 Ecology Manual. Site plans, or portions of site plans, are required for a specific permit can be found in Section 3 of this manual.

The goal of this chapter is to provide a framework for uniformity in plan preparation. Such uniformity will promote predictability throughout the region and help secure prompt governmental review and approval. Properly drafted engineering plans and supporting documents will also facilitate the operation and maintenance of the proposed system long after its review and approval.

State law requires that engineering work be performed by or under the direction of a professional engineer licensed to practice in Washington State. Plans involving construction of treatment facilities or flow control facilities (detention ponds or infiltration basins), structural source control BMPs, or drainage conveyance systems generally involve engineering principles and should be prepared by or under the direction of a licensed engineer. Construction Stormwater Pollution Prevention Plans (SWPPPs) that involve engineering calculations must also be prepared by or under the direction of a licensed engineer.

Drainage review for a proposed project's impact on surface and storm waters may be addressed by processes or requirements apart from Bothell's. Agencies such as those listed below may require some form of drainage review and impose drainage requirements that are separate from and in addition to Bothell's drainage requirements. The applicant is responsible for coordinating with these agencies and resolving any conflicts in drainage requirements.

Table 3. Other agencies with jurisdiction and permits.

Agency	Permit/Approval
Seattle/King County Department of Public Health Washington State Department of Transportation Department of Fish and Wildlife Department of Ecology Department of Natural Resources United States Army Corps of Engineers	On-site Sewage Disposal and Well permits Developer/Local Agency Agreement Hydraulic Project Approval Short Term Water Quality Modification Approval NPDES Stormwater Permits Dam Safety Permit Forest Practices Class III Permit Sections 10, 401, and 404 Permits

3.1 Stormwater Site Plans: Step-By-Step

The steps involved in developing a Stormwater Site Plan are listed below.

1. Collect and Analyze Information on Existing Conditions
2. Prepare Preliminary Development Layout
3. Perform Off-site Analysis
4. Determine Applicable Minimum Requirements
5. Prepare a Permanent Stormwater Control Plan
6. Prepare a Construction Stormwater Pollution Prevention Plan
7. Complete the Stormwater Site Plan
8. Check Compliance with All Applicable Minimum Requirements

3.1.1 Step 1 - Collect and Analyze Information on Existing Conditions

The project overview must provide a general description of the project, predeveloped and developed conditions of the site, site area and size of the improvements, and the pre- and post-developed stormwater runoff conditions. The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows. Identify the natural receiving waters that the stormwater runoff either directly or eventually (after flowing through the downstream conveyance system) discharges to, and any area-specific requirements established in local plans, ordinances, or regulations or in Water Clean-up Plans approved by Ecology.

The following figures are required to complete Step 1 of the Stormwater Site Plan:

Figure 1. Site Plan Checklist

Include a copy of the Site Plan checklist, specific to the development permit type, provided by the City of Bothell Community Development Department.

Figure 2. Site Location

Provide a map that shows the general location of the site. Identify all roads that border the site and all significant geographic features and environmentally critical areas (lakes, streams, steep slopes, wetlands, buffers, etc.).

Figure 3. Drainage Basins, Sub basins, and Site Characteristics

This figure shall display the following:

1. Show acreage of subbasins.
2. Identify all site characteristics.
3. Show existing runoff discharge points to and from the site.
4. Show routes of existing, construction, and future flows at all discharge points and downstream hydraulic structures.
5. Use a minimum USGS 1:2400 topographic map as a base for the figure.
6. Show (and cite) the length of travel from the farthest upstream end of a proposed storm system in the development to any proposed flow control facility.

Figure 4. Soils

Show the soils within the following areas:

1. The project site
2. The area draining to the site
3. The drainage system downstream of the site for the distance required by the offsite analysis (see Volume I, section 2.6.2).

All projects creating lots less than 22,000 square feet) must evaluate on-site soils for suitability for on-site stormwater management (minimum requirement 5). This soils report, as well as geotechnical investigations necessary for proposed infiltration facilities, shall be submitted under the Site Plan section titled Special Reports and Studies.

3.1.2 Step 2 - Prepare Preliminary Development Layout

Based upon the analysis of existing site conditions, locate the buildings, roads, parking lots, critical areas, and landscaping features for the proposed development. Consider the following points when laying out the site:

- Fit development to the terrain to minimize land disturbance;
Confine construction activities to the least area necessary, and away from critical areas;
- Preserve areas with natural vegetation (especially forested areas) as much as possible;
- On sites with a mix of soil types, locate impervious areas over less permeable soil (e.g., till), and try to restrict development over more porous soils (e.g., outwash);
- Cluster buildings together;
- Minimize impervious areas; and
- Maintain and utilize the natural drainage patterns.
- Adhere to Bothell Municipal Code requirements regarding building location(s), pedestrian facilities, and existing trees.

The development layout designed here will be used for determining threshold discharge areas, for calculating whether size thresholds under Minimum Requirements #6, #7, and #8 are exceeded (see Figures 2.2 and 2.3), and for the drawings and maps required for the Stormwater Site Improvement Plan.

3.1.3 Step 3 - Perform Off-site Analysis

The phased offsite analysis approach outlined in Section 2, Volume I, 2.6.2 is required. This phased approach relies first on a qualitative analysis. If the qualitative analysis indicates a potential problem, the City of Bothell may require mitigation and/or a quantitative analysis. For more information, see Section 2, Volume I, 2.6.2 of this manual. All sites that trigger drainage review shall, at a minimum, conduct a qualitative offsite analysis.

3.1.4 Step 4 - Determine Applicable Minimum Requirements

Section 2, Volume I, 2.5 of this manual establishes project size thresholds for the application of Minimum Requirements to new development and redevelopment projects. Figures 2.2, and 2.3 provide the same thresholds in a flow chart format.

3.1.5 Step 5 - Prepare a Permanent Stormwater Control Plan

Select stormwater control BMPs and facilities that will serve the project site in its developed condition. This selection process is presented in detail in the 2005 Ecology Manual, Chapter 4 of Volume I.

A preliminary design of the BMPs and facilities is necessary to determine how they will fit within and serve the entire preliminary development layout. After a preliminary design is developed, the designer may want to reconsider the site layout to reduce the need for construction of facilities, or the size of the facilities by reducing the amount of impervious surfaces created and increasing the areas to be left undisturbed. After the designer is satisfied with the BMP and facilities selections,

the information must be presented within a Drainage Review Permanent Stormwater Control Plan. The Drainage Review and Final Permanent Stormwater Control Plan should contain the following sections:

Permanent Stormwater Control Plan - Existing Site Hydrology

If flow control facilities are proposed to comply with Minimum Requirement #7, provide a listing of assumptions and site parameters used in analyzing the pre-developed site hydrology. The acreage, soil types, and land covers used to determine the pre-developed flow characteristics, along with basin maps, graphics, and exhibits for each subbasin affected by the project should be included.

For projects less than one acre and not part of a larger common plan of development or sale, the predevelopment land cover is the existing land cover.

For projects one acre or larger, or less than one acre but part of a larger common plan of development or sale, the pre-developed condition to be matched shall be forested land cover unless reasonable, historic information indicates the site was prairie prior to settlement.

Provide a topographic map, of sufficient scale and contour intervals to determine basin boundaries accurately, and showing:

- Delineation and acreage of areas contributing runoff to the site;
- Flow control facility location;
- Outfall;
- Overflow route; and
- All natural streams, wetlands, buffers, and drainage features.

The direction of flow, acreage of areas contributing drainage, and the limits of development should be indicated. Each basin within or flowing through the site should be named and model input parameters referenced.

Permanent Stormwater Control Plan - Developed Site Hydrology

All Projects:

Totals of impervious surfaces, pollution-generating impervious surfaces, and pollution generating pervious surfaces must be tabulated for each threshold discharge area for which On-site Stormwater Management BMPs are the sole stormwater management approach. These are needed to verify that the thresholds for application of treatment facilities (Minimum Requirements #6 and #8) and flow control facilities (Minimum Requirement #7 and #8) are not exceeded.

Projects and Threshold Discharge Areas within Projects That Require Treatment and Flow Control Facilities:

Provide narrative, mathematical, and graphic presentations of model input parameters selected for the developed site condition, including acreage, soil types, and land covers, road layout, and all drainage facilities.

Developed basin areas, threshold discharge areas, and flows should be shown on a map and cross-referenced to computer printouts or calculation sheets. Developed basin flows should be listed and tabulated.

Any documents used to determine the developed site hydrology should be included. Whenever possible, maintain the same basin name as used for the pre-developed site hydrology. If the boundaries of a basin have been modified by the project, that should be clearly shown on a map and the name modified to indicate the change.

Final grade topographic maps shall be provided. Finished floor elevations shall also be provided.

Permanent Stormwater Control Plan - Performance Standards and Goals

If treatment facilities are proposed, provide a listing of the water quality menus used (2005 Ecology Manual, Volume V, Chapter 3). If flow control facilities are proposed, provide a confirmation of the flow control standard being achieved (e.g., the Ecology flow duration standard).

Permanent Stormwater Control Plan - Flow Control System

Provide a drawing of the flow control facility and its appurtenances. This drawing must show basic measurements necessary to calculate the storage volumes available from zero to the maximum head, all orifice/restrictor sizes and head relationships, control structure/restrictor placement, and placement on the site.

Include computer printouts, calculations, equations, references, storage/volume tables, graphs as necessary to show results and methodology used to determine the storage facility volumes. Where the Western Washington Hydrology Model (WWHM), or other approved runoff model, is used, its documentation files should be included.

Permanent Stormwater Control Plan - Water Quality System

Provide a drawing of the proposed treatment facilities, and any structural source control BMPs. The drawing must show overall measurements and dimensions, placement on the site, location of inflow, bypass, and discharge systems.

Include WWHM or other approved model printouts, calculations, equations, references, and graphs as necessary to show the facilities are designed consistent with the 2005 Ecology Manual Volume V requirements and design criteria.

Permanent Stormwater Control Plan - Conveyance System Analysis and Design

Present an analysis of any existing conveyance systems, and the analysis and design of the proposed stormwater conveyance system for the project. This information should be presented in a clear, concise manner that can be easily followed, checked, and verified. All pipes, culverts, catch basins, channels, swales, and other stormwater conveyance appurtenances must be clearly labeled and correspond directly to the engineering plans. Conveyance specifications are provided in section 6 of this manual.

3.1.6 Step 6 - Prepare a Construction Stormwater Pollution Prevention Plan

The Construction SWPPP for projects adding or replacing 2,000 square feet of impervious surface or more, or clearing 7,000 square feet or more, must contain sufficient information to satisfy the City of Bothell that the potential pollution problems have been adequately addressed for the proposed project. An adequate Construction SWPPP includes a narrative and drawings. The narrative is a written statement to explain and justify the pollution prevention decisions made for a particular project. The narrative contains concise information concerning existing site conditions, construction schedules, and other pertinent items that are not contained on the drawings. The drawings and notes describe where and when the various BMPs should be installed, the performance the BMPs are expected to achieve, and actions to be taken if the performance goals are not achieved.

The 12 Elements listed below must be considered in the development of the Construction SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the Construction SWPPP. These elements are described in detail in Section 2, Volume II, of the 2005 Ecology Manual. They cover the general water quality protection strategies of limiting site impacts, preventing erosion and sedimentation, and managing activities and sources.

The 12 Elements are:

- Mark Clearing Limits
- Establish Construction Access
- Control Flow Rates
- Install Sediment Controls
- Stabilize Soils
- Protect Slopes
- Protect Drain Inlets
- Stabilize Channels And Outlets
- Control Pollutants
- Control De-Watering
- Maintain BMPs
- Manage the Project

A complete description and BMPs applicable to each element is given in Volume II, Chapter 3 of the 2005 Ecology Manual.

On construction sites that discharge to surface water, the primary consideration in the preparation of the Construction SWPPP is compliance with the State Water Quality Standards. The step-by-step procedure outlined in Section 2, Volume II, 3.2 of this manual is recommended for the development of these Construction SWPPPs. A checklist is contained in Volume II, Section 3.3, of the 2005 Ecology Manual that may be helpful in preparing and reviewing the Construction SWPPP.

On construction sites that infiltrate all stormwater runoff, the primary consideration in the preparation of the Construction SWPPP is the protection of the infiltration facilities from fine sediments during the construction phase and protection of ground water from other pollutants. Several of the other elements are very important at these sites as well, such as marking the clearing limits, establishing the construction access, and managing the project.

3.1.7 Step 7 - Complete the Stormwater Site Plan

The Stormwater Site Plan encompasses the entire submittal to the City of Bothell. It includes the following documents:

Project Overview

The project overview must provide a general description of the project, predeveloped and developed conditions of the site, site area and size of the improvements, and the pre- and post-developed stormwater runoff conditions. The overview should summarize difficult site parameters, the natural drainage system, and drainage to and from adjacent properties, including bypass flows.

A vicinity map should clearly locate the property, identify all roads bordering the site, show the route of stormwater off-site to the local natural receiving water, and show significant geographic features and critical areas (streams, wetlands, lakes, steep slopes, etc.).

A site map should display:

- Acreage and outlines of all drainage basins;
- Existing stormwater drainage to and from the site;
- Routes of existing, construction, and future flows at all discharge points; and
- The length of travel from the farthest upstream end of a proposed storm drainage system to any proposed flow control and treatment facility.

A soils map should show the soils within the project site. Soil Survey maps may be used. However, it is the designer's responsibility to ensure that the soil types of the site are properly identified and correctly used in the hydrologic analysis.

Existing Conditions Summary

This is the summary described in Section 2, Volume I, 3.1.1 of this manual. If the project does not require an offsite analysis, this summary should also describe:

- The natural receiving waters that the stormwater runoff either directly or eventually (after flowing through the downstream conveyance system) discharges to, and
- Any area-specific requirements established in local plans, ordinances, or regulations or in Water Clean-up Plans approved by Ecology.

Off-site Analysis Report

This is the report described under Section 2, Volume I, 3.1.3 of this manual.

Permanent Stormwater Control Plan

This is the plan described in Section 2, Volume I, 3.1.5 of this manual.

Construction Stormwater Pollution Prevention Plan

This is the plan described in Section 2, Volume I, 3.1.6 of this manual.

Special Reports and Studies

Include any special reports and studies conducted to prepare the Stormwater Site Plan (e.g., soil testing, wetlands delineation).

Other Permits

Include a list of other necessary permits and approvals as required by other regulatory agencies, if those permits or approvals include conditions that affect the drainage plan, or contain more restrictive drainage-related requirements.

Operation and Maintenance Manual

Submit an operations and maintenance manual for each flow control and treatment facility. The manual should contain a description of the facility, what it does, and how it works. The manual must identify and describe the maintenance tasks, and the frequency of each task. The maintenance tasks and frequencies must meet the standards established in this manual.

Include a recommended format for a maintenance activity log that will indicate what actions will have been taken.

The manual must prominently indicate where it should be kept, and that it must be made available for inspection by the City of Bothell.

Bond Quantities

Refer to Additional Requirements, Financial Guarantees, Section 2, Volume I, 2.6.1 of this manual. All drainage facilities constructed or modified for projects, and any work performed in the right-of-way, must comply with the financial guarantee requirements in Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications. Project proponent shall provide financial guarantees documentation in the Stormwater Site Plan.

3.1.8 Step 8 - Check Compliance with All Applicable Minimum Requirements

A Stormwater Site Plan as designed and implemented should specifically fulfill all Minimum Requirements applicable to the project. The Stormwater Site Plan should be reviewed to check that these requirements are satisfied.

3.2 Plans Required After Stormwater Site Plan Approval

See Section 3 of this manual for detailed specifications of Final Stormwater Site Plan requirements.

Chapter 4 - BMP and Facility Selection Process for Permanent Stormwater Control Plans

Adopted in full. Refer to the 2005 Ecology Manual Volume I directly for this chapter.

Appendix I-A through Appendix I-E

Appendix I-D: Bothell Municipal Code (BMC) 14.04.530 A, B, and C provide guidelines and requirements for the use of wetlands in stormwater management. Project proponents shall adhere to performance standards detailed in BMC 14.04.

All other Appendices are adopted in full. Refer to the 2005 Ecology Manual Volume I directly for all other appendices.

Volume II - Construction Stormwater Pollution Prevention

Chapter 1 - Introduction to Construction Stormwater Pollution Prevention

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Chapter 2 - Regulatory Requirements

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Chapter 3 - Planning

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Chapter 4 - Standards and Specifications for Best Management Practices

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Appendix II-A - Standard Notes for Erosion Control

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Appendix II-B - Background Information on Chemical Treatment

Adopted in full. Refer to Volume II of the 2005 Ecology Manual.

Volume III - Hydrologic Analysis and Flow Control Design

Chapter 1 - Introduction

Adopted in full. Refer to Volume III of the 2005 Ecology Manual.

Chapter 2 - Hydrologic Analysis

Adopted in full. Refer to Volume III of the 2005 Ecology Manual.

Chapter 3 - Flow Control Design

This manual adds the following requirements:

- Any above-ground stormwater facility will be screened from public right of way and adjacent property per the underlying zoning perimeter buffer requirements in the BMC.
- Detention facilities for all single family residential developments shall be located in a private detention tract, outside of the public right-of-way, unless approved in writing from the Public Works Director. For all other projects, detention facilities shall be located on private property.

The remainder of this chapter is adopted in full. Refer to Volume III of the 2005 Ecology Manual.

Appendix III-A through Appendix III-D

Adopted in full. Refer to Volume III of the 2005 Ecology Manual.

Volume IV - Source Control BMPs

Chapter 1 - Introduction

Adopted in full. Refer to Volume IV of the 2005 Ecology Manual.

Chapter 2 - Selection of Operational and Structural Source Control BMPs

Adopted in full. Refer to Volume IV of the 2005 Ecology Manual.

Appendix IV-A through Appendix IV-G

Adopted in full. Refer to Volume IV of the 2005 Ecology Manual.

Volume V - Runoff Treatment BMPs

Chapter 1 - Introduction

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 2 - Treatment Facility Selection Process

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 3 - Treatment Facility Menus

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 4 - General Requirements for Stormwater Facilities

This manual adds the following requirements:

- Any above-ground stormwater facility will be screened from public right of way and adjacent property per the underlying zoning perimeter buffer requirements in the BMC.
- Treatment facilities for all single family residential developments shall be located in a private tract, outside of the public right-of-way, unless approved in writing from the Public Works Director. For all other projects, treatment facilities shall be located on private property.

The remainder of this chapter is adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 5 - On-site Stormwater Management

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 6 - Pretreatment

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 7 - Infiltration and Bio-infiltration Treatment Facilities

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 8 - Sand Filtration Treatment Facilities

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 9 - Biofiltration Treatment Facilities

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 10 - Wetpool Facilities

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 11 - Oil and Water Separators

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Chapter 12 - Emerging Technologies

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Appendix V-A through Appendix V-D

Adopted in full. Refer to Volume V of the 2005 Ecology Manual.

Section 3 - Drainage Review

Drainage review is required for any proposed project that is subject to one of the following Bothell development proposal, permit, or approvals: Preliminary Subdivision, Short Plat, Boundary Line Adjustment, Land Clearing Permit, Building Permit, Conditional Use Permit, Critical Area Alteration, Planned Unit Development (PUD), and Right of Way Invasion Permit. In addition to the listed development actions, the proposed project must meet one of the following conditions to trigger drainage review:

- Adds or replaces 2,000 sf or more of new impervious surface, OR
- Disturbs 7,000 sf, converts 2.5 acres or more of native vegetation to pasture, converts 3/5 acres or more native vegetation to landscape, OR
- Involves a ditch or pipe drainage conveyance 12 inches or greater in diameter, OR
- Contains or is adjacent to a critical area or critical area buffer (BMC 14.04), OR
- Is a redevelopment project proposing improvements to a high-use site, OR
- Is a redevelopment project proposing improvements - including interior improvements - that exceed 50% of the assessed value (or replacement value) of the existing site improvements.

3.1 Drainage Review Types

For most projects adding 5,000 square feet or more of impervious surface, the full range of minimum requirements contained in Section 2, Volume I of this manual and additional requirements in Section 2, Volume I, of this manual must be evaluated for compliance through the drainage review process. However, for some types of projects the scope of requirements applied is narrowed to allow more efficient, customized review. Each of the following drainage review types tailors the review process and application of drainage requirements to a project's size, location, type of development, and anticipated impacts to the local and regional surface water system:

- Small Site Drainage Review, 3.1.1
- Targeted Drainage Review, 3.1.2
- Full Drainage Review, 3.1.3

Each project requires only one of the above drainage review types, with the single exception that a project which qualifies for Small Site Drainage Review may also require Targeted Drainage Review. Figure 3.1 can be used to determine which drainage review type would be required. This may entail consulting the more detailed thresholds for each review type specified in the above-referenced Sections.

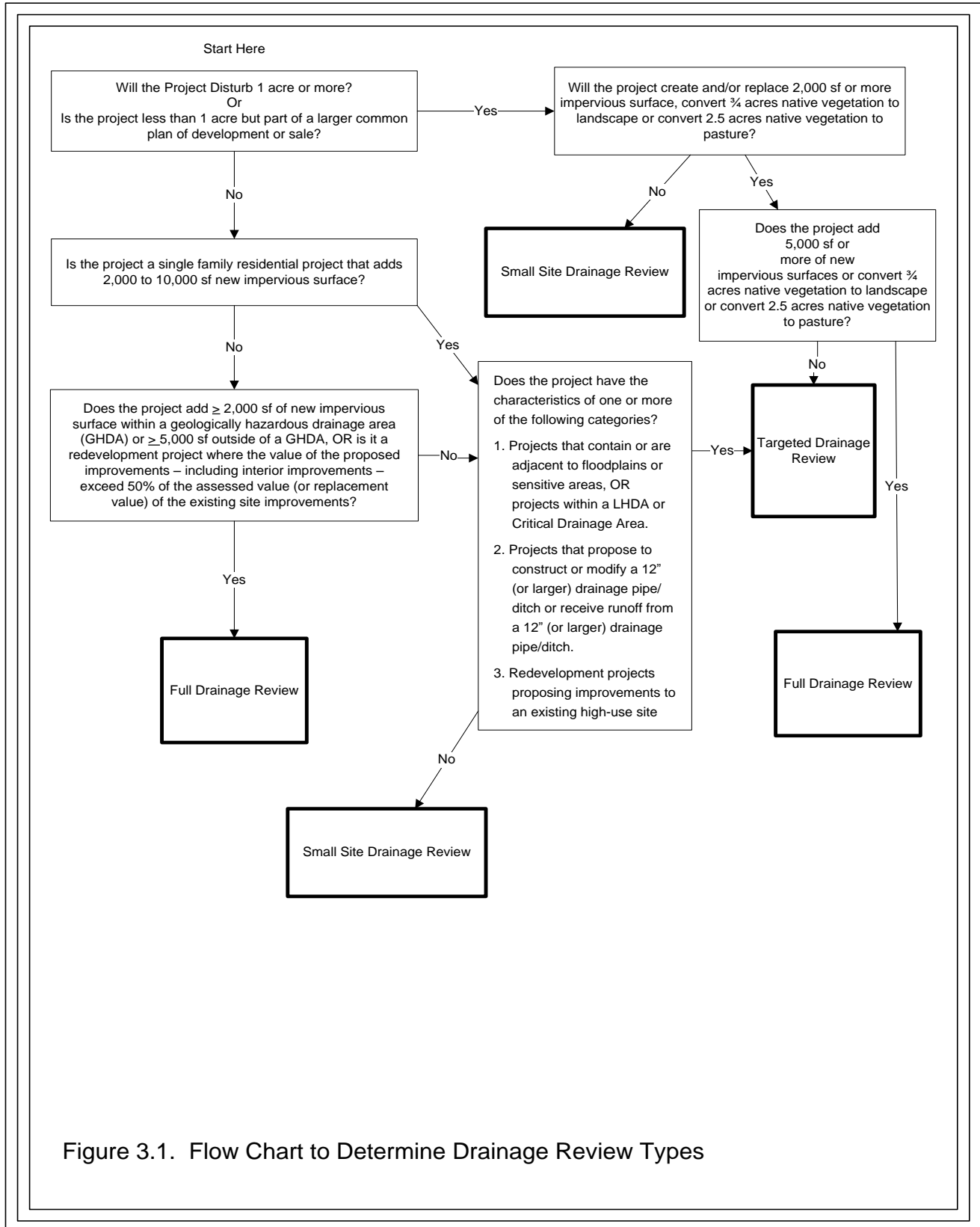


Figure 3.1. Flow Chart to Determine Drainage Review Types

Figure 3.1 Flow Chart to Determine Drainage Review Type

3.1.1 Small Site Drainage Review

Small Site Drainage Review is a simplified Drainage Review for small projects. The minimum requirements applied under Full Drainage Review are replaced with simplified small site requirements which can be applied by a non-engineer.

These requirements include flow control Best Management Practices (BMPs) such as setting aside open space to limit future site clearing, incorporating low impact development techniques as appropriate, and using simple measures such as splash blocks and gravel trenches to disperse or infiltrate runoff from impervious areas. Refer to minimum requirement 5 (Section 2, Volume I, 2.5.5 of this manual). Some projects will not have the soils necessary to accommodate on-sites stormwater management.

Small Site Drainage Review sites are required to meet minimum requirement 2, Construction Stormwater Pollution Prevention (Volume I, chapter 2, section 2.5.2 of this manual). For small sites, some elements of minimum requirement 2 may not apply. This alternative to Full Drainage Review acknowledges that drainage impacts for many small development proposals can be effectively mitigated without construction of costly sediment and erosion controls.

The Small Site Drainage Review process minimizes the time and effort required to design, submit, review, and approve drainage facilities for these proposals. In most cases, the requirements can be met with submittals prepared by contractors, architects, or homeowners without the involvement of a licensed civil engineer.

Threshold

Small Site Drainage Review is allowed for any project that is subject to drainage review that meets the following criteria:

- Projects that disturb less than 1 acre and are not part of a larger common plan of development or sale -
 - That are single family residential projects that add 2,000 to 10,000 sf of new impervious surface and:
 - do not contain or are adjacent to flood plains or critical areas, or within an LHDA or Critical Area,
 - do not construct or modify a 12" or larger drainage pipe/ditch.
 - do not involve High-use site improvements.
 - Any project type, besides single family residential projects, that adds less than 2,000 sf new impervious in an LHDA or less than 5,000 sf new impervious outside LHDA or is a redevelopment project where the value of the proposed improvements - including interior improvements - does not exceed 50% of the assessed value (or replacement value) of the existing site improvements.

To qualify for small site drainage review, the non single family residential project must also:

- not contain or be adjacent to flood plains or critical areas, or within an LHDA or Critical Drainage Area,
- not construct or modify a 12" or larger drainage pipe/ditch.
- not involve High-use site improvements that cost \$100,000 or more.
- Projects that disturb 1 acre or more or projects less than 1 acre but part of a larger common plan of development or sale -
 - New development projects add or replace less than 2,000 sf of impervious surface, convert less than $\frac{3}{4}$ acres of native vegetation to landscape, and/or convert less than 2.5 acres of native vegetation to pasture.
- Redevelopment Projects - Any redevelopment project that disturbs less than 1 acre and adds and/or replaces less than 2,000 sf of impervious surface.

IF Small Site Drainage Review is allowed, THEN the applicant may apply the simplified small site submittal and drainage design requirements detailed in Section 6 of this manual.

The simplified drainage requirements applied under Small Site Drainage Review are considered sufficient to meet the overall intent of the minimum requirements, except under certain conditions when a proposed project has characteristics that trigger Targeted Drainage Review (see the threshold for Targeted Drainage Review in Section 3.1.2) and may require the involvement of a licensed civil engineer. Therefore, any proposed project that qualifies for Small Site Drainage Review as determined above and complies with the small site drainage requirements is considered exempt from all minimum requirements, excluding minimum requirements 2 and 5, except those which would apply to the project if it is subject to Targeted Drainage Review as specified in Section 2, Volume I, 3.1.2 of this manual. Financial Guarantees may be required, refer to Chapter 1, section 1-5 of the City of Bothell Design and Construction Standards and Specifications.

3.1.2 Targeted Drainage Review

Targeted Drainage Review (TDR) is an abbreviated evaluation by Public Works permit review staff of a proposed project's compliance with minimum requirements. Projects subject to this type of drainage review are typically small-site proposals or other small projects that have site-specific or project specific drainage concerns that must be addressed by a licensed civil engineer. Under Targeted Drainage Review, engineering costs associated with drainage design and review are kept to a minimum because the review includes only those requirements that would apply to the particular project.

Threshold

Targeted Drainage Review is required for those projects subject to drainage review AND which are not subject to Full Drainage Review as determined in Section 2, Volume I, 3.1.3 of this manual, AND which have the characteristics of one or more of the following project categories:

- Projects that disturb less than 1 acre and are not part of a larger common plan of development or sale -
 - TDR Project Category #1: Projects that contain or are adjacent to a floodplain, stream, lake, wetland, closed depression, or other critical area as defined by Bothell Municipal Code (BMC) 14.04; OR projects located within a Geologically Hazardous Drainage Area.
 - TDR Project Category #2: Projects that propose to construct or modify a drainage pipe/ditch that is 12" or more in size/depth or receives surface and storm water runoff from a drainage pipe/ditch that is 12" or more in size/depth.
 - TDR Project Category #3: Redevelopment projects that propose improvements to an existing high-use site.
- Projects that disturb 1 acre or more or projects less than 1 acre but part of a larger common plan of development or sale -
 - TDR Project Category #4: new development projects that add 2,000 sf or more but less than 5,000 sf impervious surface, convert less than $\frac{3}{4}$ acres of native vegetation to landscape, and/or convert less than 2.5 acres of native vegetation to pasture.
 - TDR Project Category #5: redevelopment projects that add or replace 2,000 sf or more but less than 5,000 sf impervious surface, convert less than $\frac{3}{4}$ acres of native vegetation to landscape, and/or convert less than 2.5 acres of native vegetation to pasture AND the proposed improvement value (interior and exterior improvements) must not exceed 50% of the assessed value of the existing site improvements.
 - TDR Project Category # 6: road-related projects that add less than 5,000 sf of new impervious surface. If the road-related project adds more than 5,000 sf new impervious, it can still qualify for TDR Category #6 if the project does not add more than 50% impervious surface to the existing impervious surface within the project's limits.

IF Targeted Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with the minimum requirements corresponding to the project category or categories that best match the proposed project. The project categories and applicable requirements for each are described below and illustrated in Figures 2.2, and 2.3.

Note: If the proposed project has the characteristics of more than one project category, the requirements of each applicable category shall apply.

Compliance with these requirements requires submittal of engineering plans and/or calculations stamped by a licensed civil engineer registered in the state of Washington, unless deemed unnecessary by the Public Works Director. The engineer need only demonstrate compliance with those minimum requirements that have been predetermined to be applicable based on specific project characteristics.

TDR Project Category #1

This category includes projects that are too small to trigger full drainage review, but may be subject to site-specific floodplain or critical area requirements, or other area-specific drainage requirements adopted by the City of Bothell. Such projects primarily include single family residential projects.

IF the proposed project meets the characteristics of TDR Project Category #1, THEN the applicant must demonstrate that the project complies with all applicable minimum requirements as determined by the City of Bothell Public Works Director. Project proponents will adhere to conveyance system specifications detailed in Section 5 of this manual. Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

TDR Project Category #2

This category is intended to apply selected minimum requirements to those projects that propose to construct or modify a drainage pipe or ditch 12 inches in diameter or larger, but are not adding sufficient impervious surface to trigger Full Drainage Review.

IF the proposed project meets the characteristics of TDR Project Category #2, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Minimum Requirement 1 - Stormwater Site Plan and Site Improvement Plan
- Minimum Requirement 2 -Construction Stormwater Pollution Prevention Plan
- Minimum Requirement 3 - Source Control of Pollutants
- Minimum Requirement 4 - Preserve Natural Drainage and Outfall(s)
- Minimum Requirement 5 - On-site Stormwater Management
- Minimum Requirement 10 - Operation and Maintenance Manual (if applicable)
- Comply with Conveyance System Specifications in Section 5 of this manual.

- Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.

TDR Project Category #3

This category is intended to improve water quality by applying source control, and oil control water quality treatment to redevelopment projects located on the most intensively used sites developed prior to current water quality requirements. These are referred to as high-use sites and are defined below.

High-Use Site Definition: A high-use site is any one of the following:

- A commercial or industrial site with an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area, OR
- A commercial or industrial site subject to petroleum storage or transfer in excess of 1,500 gallons per year, not including delivered heating oil, OR
- A commercial or industrial site subject to use, storage, or maintenance of a fleet of 25 or more diesel vehicles that are over 10 tons net weight (e.g., trucks, buses, trains, heavy equipment, etc.), OR
- A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

IF the proposed project meets the characteristics of TDR Project Category #3, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Minimum Requirement 1 - Stormwater Site Plan and Site Improvement Plans
- Minimum Requirement 2 -Construction Stormwater Pollution Prevention Plan
- Minimum Requirement 3 - Source Control of Pollutants
- Minimum Requirement 4 - Preserve Natural Drainage and Outfall(s)
- Minimum Requirement 6 - Runoff Treatment (limited to oil control only)
- Minimum Requirement 10 - Operation and Maintenance Manual
- Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.
- Comply with Conveyance System Specifications in Section 5 of this manual.

Note: In some cases, Public Works may determine that application of these requirements does not require submittal of engineering plans and calculations stamped by a licensed civil engineer. For example, if catch basin inserts are proposed to meet oil control requirements, engineered plans and calculations may not be necessary. A plot plan showing catch basin locations may suffice.

TDR Project Category #4

This category is intended to reduce the minimum requirements for new development projects that do not qualify for small site drainage review but are not large enough to warrant full drainage review.

IF the proposed project meets the characteristics of TDR Project Category #4, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Minimum Requirement 1 - Stormwater Site Plan and Site Improvement Plans
- Minimum Requirement 2 -Construction Stormwater Pollution Prevention Plan
- Minimum Requirement 3 - Source Control of Pollutants
- Minimum Requirement 4 - Preserve Natural Drainage and Outfall(s)
- Minimum Requirement 5 - On-site Stormwater Management
- Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.
- Comply with Conveyance System Specifications in Section 5 of this manual.

TDR Project Category #5

This category is intended to reduce the minimum requirements for redevelopment projects that do not qualify for small site drainage review but are not large enough to warrant application of all minimum requirements.

IF the proposed project meets the characteristics of TDR Project Category #5, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Minimum Requirement 1 - Stormwater Site Plan and Site Improvement Plans
- Minimum Requirement 2 -Construction Stormwater Pollution Prevention Plan
- Minimum Requirement 3 - Source Control of Pollutants
- Minimum Requirement 4 - Preserve Natural Drainage and Outfall(s)
- Minimum Requirement 5 - On-site Stormwater Management
- Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.
- Comply with Conveyance System Specifications in Section 5 of this manual.

TDR Project Category #6

This category is intended to reduce the minimum requirements for road-related projects that do not qualify for small site drainage review but are not large enough to warrant full drainage review.

IF the proposed project meets the characteristics of TDR Project Category #6, THEN the applicant must demonstrate that the proposed project complies with the following requirements:

- Minimum Requirement 1 - Stormwater Site Plan and Site Improvement Plans
- Minimum Requirement 2 -Construction Stormwater Pollution Prevention Plan

- Minimum Requirement 3 - Source Control of Pollutants
- Minimum Requirement 4 - Preserve Natural Drainage and Outfall(s)
- Minimum Requirement 5 - On-site Stormwater Management
- Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications.
- Comply with Conveyance System Specifications in Section 5 of this manual.

3.1.3 Full Drainage Review

Full Drainage Review is the evaluation by Public Works permit review staff of a proposed project's compliance with the full range of minimum requirements and additional requirements in Section 2, Volume I of this manual. This review addresses the impacts associated with adding new impervious surface and changing land cover on typical sites.

Threshold

Full Drainage Review is required for any proposed projects, including redevelopment projects, that are subject to drainage review and which meet one or more of the following criteria:

- Projects that disturb less than 1 acre and are not part of a larger common plan of development or sale -
 - Projects which add 5,000 square feet or more of new impervious surface but which do not qualify for Small Site Drainage Review OR
 - Projects located within a Landslide Hazard Drainage Area which add 2,000 square feet or more of new impervious surface but which do not qualify for Small Site Drainage Review OR
 - Redevelopment project where the value of the proposed improvements - including interior improvements - exceed 50% of the assessed value (or replacement value) of the existing site improvements
- Projects that disturb 1 acre or more or projects less than 1 acre but part of a larger common plan of development or sale -
 - Projects that add 5,000 sf of new impervious surface, convert $\frac{3}{4}$ acres native vegetation or more to landscape, or 2.5 acres or more of native vegetation to pasture.
 - Redevelopment Projects that add 5,000 sf of new impervious surface, convert $\frac{3}{4}$ acres native vegetation or more to landscape, or 2.5 acres or more of native vegetation to pasture, or increase the assessed value of the existing site by 50% or more.
 - Road-related projects that include 5,000 sf or more new plus replaced impervious surface.

IF Full Drainage Review is required, THEN the applicant must demonstrate that the proposed project complies with all minimum requirements. Financial guarantees are required in accordance with Chapter 1, section 1-5, of the City of Bothell Design and Construction Standards and Specifications. Conveyance system specifications in section 5 of this manual shall be required. Some minimum requirements will not be applicable to all projects but need to be considered for any project in full drainage review.

If the project will result in 50 acres or more of new impervious surface, the project proponent will be required to meet additional requirements. This will include the development of a Master Drainage Plan (MDP).

Engineering plans and calculations stamped by a licensed civil engineer registered in the state of Washington must be submitted in full drainage review and demonstrate compliance with requirements. The procedures and requirements for submittal of engineering plans and calculations can be found in Section 3.2 of this manual.

3.2 Drainage Plan Submittal Requirements

A licensed civil engineer registered in the State of Washington must stamp all preliminary and development review plans, excluding small site drainage review plans.

A professional land surveyor registered in the State of Washington must stamp legal descriptions used for preliminary and engineering plans. Topographic survey data and mapping prepared specifically for a proposed project may be performed by the licensed civil engineer stamping the engineering plans as allowed by the Washington State Board of Registration for Professional Engineers and Land Surveyors.

3.2.1 Types of Plans

Stormwater Site Plan (SSP)

The SSP includes various reports and documentation of the project. The following are the different reports required in the SSP. Different levels of reports are required for development permit application, drainage review, and final SSP submittal. The Stormwater Site Plans documents include the following:

- ***Existing Conditions Summary***
 - Basic summary of existing conditions. Defined in Section 2, Volume I, 3.1.1 of this manual. Most existing conditions will be identified with the Existing Conditions Drainage Site Improvement Plan (defined below). This summary would include narrative descriptions not made obvious by the drainage site improvement plans.
- ***Offsite Analysis***
 - Qualitative Offsite Analysis: Defined in Section 2, Volume I, 2.6.2 of this manual.
 - Quantitative Offsite Analysis: Defined in Chapter 2, Volume I, 2.6.2 of this manual.
- ***Permanent Stormwater Control Plan***
 - Preliminary Permanent Stormwater Control Plan - Defined in Section 2, Volume I, 3.1.5 of this manual.
 - Drainage Review Permanent Stormwater Control Plan - Defined in Section 2, Volume I, 3.1.5 of this manual. This includes conveyance analysis and design, water quality facility selection and design, and flow control facility selection and design. The 2005 Ecology Manual, Volume I, section 4.2 shall be used for guidance in selecting facilities.
 - Final Permanent Stormwater Control Plan - see Section 2, Volume I, 3.2.2 of this manual.
- ***Operation and Maintenance Manual***

The Operations and Maintenance Manual shall be in accordance with Minimum Requirement 10. Details can be found in Section 2, Volume I, 2.5.10 of this manual.

- ***Other Permits***

Include a list of other necessary permits and approvals as required by other regulatory agencies, if those permits or approvals include conditions that affect the drainage plan, or contain more restrictive drainage-related requirements.

- ***Special Reports***

Include any special reports and studies conducted to prepare the Stormwater Site Plan (e.g., geotechnical report, wetland delineation).

Drainage Site Improvement Plans (SIP)

Site improvement plans shall portray design concepts in a clear and concise manner. The plans must present all the information necessary for persons trained in engineering to review the plans, as well as those persons skilled in construction work to build the project according to the design engineer's specifications. Supporting documentation for the drainage site improvement plans must also be presented in an orderly and concise format that can be systematically reviewed and understood by others.

Types of Drainage Site Improvement Plans:

- Small Site Improvement Plans - See section 5 of this manual.
- Existing Conditions SIP - see Section 2, Volume I, 3.1.1 of this manual. Refer to Section 4 of this manual for SIP technical specifications.
- Preliminary Development Layout - see Section 2, Volume I, 3.1.2 of this manual. Refer to Section 4 of this manual for SIP technical specifications. Preliminary Drainage SIPs must also meet requirements in BMC 11.06.002.
- Drainage Review Development Layout - see Section 2, Volume I, 3.1.2 of this manual. Refer to Section 4 of this manual for SIP technical specifications.
- Final Development Layout - see Section 2, Volume I, 3.2.2 of this manual. Refer to Section 4 of this manual for SIP technical specifications.
- Preliminary Stormwater Control SIP - Defined in Section 2, Volume I, 3.1.5 of this manual. Refer to Section 4 of this manual for SIP technical specifications.
- Drainage Review Stormwater Control SIP - Defined in Section 2, Volume I, 3.1.5 of this manual. Refer to Section 4 of this manual for SIP technical specifications.
- Final Stormwater Control SIP - see Section 2, Volume I, 3.2.2 of this manual. Refer to Section 4 of this manual for SIP technical specifications.

Temporary Erosion and Sediment Controls (TESC) Plan

- Small Site Drainage TESC Plan - See Section 5 of this manual.
- TESC Site Plan
- Construction Stormwater Pollution Prevention Plan (SWPPP) - See Volume II of the 2005 Ecology manual for specifications.

3.2.2 Minimum Drainage Plans Required with Development Permit Application

Bothell Municipal Code (BMC) 11.04 defines land use action types I, II, III, IVA, IVB, V, and exempt land use actions. Drainage review is required based on development permit type issued and thresholds identified at the beginning of this section (section 3 of this manual). Drainage review is not dependent on land use action types. Requirements and procedures for land use action types are dependent on development permit type and if SEPA review is required (see BMC 11.04). All project applications shall adhere to requirements established for permit applications in BMC 11.06.002. The following provides what drainage plans are required for development permit application, based on permit types.

Permit Types: Preliminary Subdivision, Short Plat, Preliminary Planned Unit Development, Binding Site Plan

Stormwater Site Plan - Existing Conditions Summary, Qualitative Offsite Analysis, Drainage Review Permanent Stormwater Control Plan.

Site Improvement Plan - Existing Conditions SIP, Drainage Review Layout SIP, Drainage Review Stormwater Control SIP. Refer to Section 4 of this manual for drainage SIP technical specifications. Existing Conditions SIP will be generated by a licensed land surveyor. Additional plans may be required for review outside of drainage review.

Permit Types: Short Subdivisions

Stormwater Site Plan - Existing Conditions Summary, Qualitative Offsite Analysis, Preliminary Stormwater Control Plan (if site requires stormwater controls).

Site Improvement Plan - Existing Conditions SIP, Preliminary Layout SIP, and Preliminary Stormwater Control SIP (if site requires stormwater controls). Project proponents in the short subdivision application process may be allowed to submit modified SIP as defined in Section 4, 4.1.1 of this manual. Additional plans may be required for review outside of drainage review.

Permit Types: Commercial Building Permit and Other Non Single Family Residential Building Permits

Applications for commercial permits require that drainage review plans be submitted as part of the initial permit application. Most commercial projects will go through Full Drainage Review and require complete engineering plans. Projects that may qualify for limited scope engineering design should request Targeted Drainage Review during the preapplication meeting.

Stormwater Site Plan - Existing Conditions Summary, Qualitative Offsite Analysis, Drainage Review Permanent Stormwater Control Plan (if site requires stormwater controls, see

minimum requirements, Section 2, Volume I, 2.4 of this manual). Operations and maintenance manual, other permits, and special reports are required during application process.

Site Improvement Plan - Existing Conditions SIP, Drainage Review Layout SIP, and Drainage Review Stormwater Control SIP (if site requires stormwater controls). Additional plans may be required for review outside of drainage review.

Single Family Residential Building Permit

Stormwater Site Plan - Single family residential projects in targeted review will be required to deliver some of the Stormwater Site Plan requirements (see the Section 3, 3.1.2 of this manual). Single family residential projects in small site drainage review are not required to develop stormwater site plans.

Single Family Site Improvement Plan - Small Site Improvement Plans for sites that qualify for small site drainage review - See section 5 of this manual. All other single family developments shall provide Existing Conditions SIP, Drainage Review Layout SIP, and Preliminary Stormwater Control SIP (if site requires stormwater controls). Additional plans may be required for review outside of drainage review.

All other Permits: Boundary Line Adjustment, Land Clearing Permit, Conditional Use Permit, Critical Area Alteration, and Right of Way Invasion Permit.

Other permit applications will require project-specific information. Initial drainage submittal requirements can be obtained by contacting Community Development or Public Works or by reviewing the application requirements for each permit as defined in in the following Bothell Municipal Code:

- BMC 12.12.040: Land Clearing Plan Requirements
- BMC 12.18.130: Landscaping Plan Requirements
- BMC 12.28.030: Conditional Use Permit Plan Requirements
- BMC 12.30.050: Preliminary PUD Plan Requirements
- BMC 12.30.080: Final PUD Plan Requirements
- BMC 12.36.030: Variance Plan Requirements
- BMC 14.04: Critical Area Alteration Plan Requirements
- BMC 15.08.020: Preliminary Short Plat Plan Requirements
- BMC 15.10.020: Final Plat Plan Requirements

Additional plans may be required for review outside of drainage review.

3.3 Plans Required for Drainage Review

Full Drainage Review

Complete Stormwater Site Plan, including: Existing Conditions Summary, Quantitative Offsite analysis (if qualitative offsite analysis triggers further investigation), Drainage Review Permanent Control Plan, Operation and Maintenance Manual, Other Permits, Special Reports, and financial guarantees.

Site Drainage Improvement Plans: Existing Conditions SIP, Drainage Review Development Layout, Drainage Review Stormwater Control SIP. All other Site Improvements Plans required by Section 4 of this manual.

Temporary Erosion and Sediment Controls Plan - Stormwater Pollution Prevention Plan (SWPPP), see section 2, Volume II of the 2005 Ecology manual. Some elements of the SWPPP may not apply to every site, all elements should be evaluated. TESC Site Improvement Plans are also required.

Targeted Drainage Review

Stormwater Site Plan, including: Existing Conditions Summary, Quantitative Offsite analysis (if qualitative offsite analysis triggers further investigation), Drainage Review Permanent Control Plan (if applicable), Operation and Maintenance Manual (if required), Other Permits (if applicable), and Special Reports(if applicable).

Site Drainage Improvement Plans: Existing Conditions SIP, Drainage Review Development Layout, Drainage Review Stormwater Control SIP. All other Site Improvements Plans required by Section 4 of this manual.

Temporary Erosion and Sediment Controls Plan - Stormwater Pollution Prevention Plan (SWPPP), see Volume II of the 2005 Ecology manual. Some elements of the SWPPP may not apply to every site, all elements should be evaluated. TESC Site Improvement Plans are also required.

Small Site Drainage Review

Site Drainage Improvement Plans: Small Site Drainage SIP. See Section 6 of this manual.

Temporary Erosion and Sediment Controls Plan - Small Drainage TESC Plan, see section 6 of this manual. Sites that disturb less than 7,000 sf are not required to submit a Stormwater Pollution Prevention Plan (SWPPP) but are required to consider all elements of the SWPPP in creating the small site TESC plan. Site disturbing more than 7,000 sf are required to develop a SWPPP and provide a Small Drainage TESC Plan.

3.4 Plans Required After Drainage Review

3.4.1 Plan Changes after Permit Issuance

If changes or revisions to the originally approved engineering plans require additional review, the revised plans shall be submitted to the Bothell Department of Public Works for approval prior to construction. The plan change submittals shall include all of the following:

1. The appropriate Field Change form(s)
2. Revised SSP or addendum
3. Revised SIP(s)
4. Other information needed for review.

3.4.2 Final Corrected Plan Submittal

During the course of construction, changes to the approved engineering plans are often required to address unforeseen field conditions or design improvements. Once construction is completed, it is the applicant's responsibility to submit to the Bothell Department of Public Works a final corrected plan ("as-builts"), which is an engineering drawing that accurately represents the project as constructed. These corrected drawings must be professionally drafted revisions applied to the original approved plan and must include all changes made during the course of construction; the TESC plan, however, should not be included. The final corrected plan must be stamped, signed, and dated by a licensed civil engineer registered in the State of Washington.

Refer to Chapter 1, section 1-14, of the City of Bothell Design and Construction Standards and Specifications "As Built (Construction Corrected Record) Drawing" requirements.

The Engineer of record shall inspect flow control and water quality treatment facilities post construction and certify that all facilities have been built to design specifications detailed in the Final Stormwater Control Site Improvement Plan and as described in the Stormwater Site Plan, "Final Stormwater Control Plan."

In addition to the requirements described in Chapter 1 of the City of Bothell Design and Construction Standards and Specifications, as builts must include the following information:

- Indicate dimensions of all easements, tracts, building setbacks, tops of slopes, wetland boundaries, and floodplains.
- Include pertinent restrictions as they apply to easements, tracts, and building setback lines.
- Include the dedication and indemnification clause required by King or Snohomish County, as appropriate.

- State the maximum amount of added impervious surface and proposed clearing per lot as determined through engineering review. The maximum amount of impervious surface may be expressed in terms of square feet.
- Specify roof downspout controls by lot based on the "Flow Credit for Roof Downspout Controls" (see Volume III, Chapter 3 of the 2005 Ecology Manual) as determined through engineering review and approval.
- For a plat or short plat, record a note conditioning single family residential permit approval on compliance with approved roof downspout controls (Volume III, Chapter 3 of the 2005 Ecology Manual).

Section 4 - Site Improvement Plan Technical Specifications

4.1 Site Improvement Plans Technical Requirements

The vertical datum on which all engineering plans, plats, binding site plans, and short plats are to be based must be the North American Vertical Datum of 1988 (NAVD 88), and the datum must be tied to at least one City of Bothell Survey Control Network benchmarks. The benchmark(s) shall be shown or referenced on the plans. If a City of Bothell control network benchmark does not exist within $\frac{1}{2}$ mile of the subject property, or if 250 feet or greater of total vertical difference exists between the starting benchmark and the project, an assumed or alternate vertical datum may be used.

Horizontal control for all plats, binding site plans, and short plats shall reference the North American Datum of 1983/91 as the coordinate base and basis of bearings. All horizontal control for these projects must be referenced to a minimum of two City of Bothell Horizontal Control monuments. If two horizontal control monuments do not exist within one mile of the project, an assumed or alternate coordinate base and basis of bearings may be used. Horizontal control monument and benchmark information is available from the Bothell Department of Public Works.

The site improvement plans consist of all the plans, profiles, details, notes, and specifications necessary to construct road, drainage structure, and off-street parking improvements. Site improvement plans include the following:

- A base map (see table 4.1) and
- Site plan and profiles (Section 4.2 of this manual).

Note: Site plans must also include grading plans if on-site grading extends beyond the roadway.

4.1.1 General Site Drainage Improvement Plan Format

Refer to Chapter 1, section 1-9 of the City of Bothell Design and Construction Standards and Specifications for all general plan format requirements.

4.1.2 Site Drainage Improvement Plan Base Map

A site drainage improvement plan base map provides a common base and reference in the development and design of any project. A base map helps ensure that the engineering plans, grading plans, and TESC plans are all developed from the same background information. This base map shall include the information listed in Table 4.1 below.

Table 4.1 Drainage Base Map Requirements

TABLE 4.1 DRAINAGE BASE MAP REQUIREMENTS	
Feature	Requirements
Ground Surface Topography	Provide topography within the site and extending beyond the property lines. Contour lines must be shown as described in "Plan View: Site Plan and Roadway Elements" (section 4, 4.2.1)
Surface Water Discharge	Provide ground surface elevations for a reasonable "fan" around points of discharge extending at least 50 feet downstream of all point discharge outlets.
Hydrologic Features	Provide spot elevations in addition to contour lines to aid in delineating the boundaries and depth of all existing floodplains, wetlands, channels, swales, streams, storm drainage systems, roads (low spots), bogs, depressions, springs, seeps, swales, ditches, pipes, groundwater, and seasonal standing water.
Other Natural Features	Show the location and relative sizes of other natural features such as rock outcroppings, existing vegetation, and trees 12" in diameter and greater that could be disturbed by the project improvements and construction activities (within tree canopy), noting species.
Flow	Provide arrows that indicate the direction of surface flow on all public and private property and for all existing conveyance systems.
Floodplains/ Floodways	Show the floodplain/floodways as depicted on FEMA maps or otherwise required by the City of Bothell Critical Areas Regulations.
General Background Information	Show the location and limits of all existing: <ul style="list-style-type: none"> • Property boundaries • Structures • Easements (including dimensions) • Total property (including dimensions) • Roads and right-of-way • Sanitary sewers and water utilities • Common open space • Public dedications • Other manmade features affecting existing topography/proposed improvements.
Development Limitations	Delineate limitations to the development that may occur.

4.2 Site Improvement Plan Profiles

The applicant shall include plans, information, and profiles for all projects, per Bothell Municipal Code. Bothell Municipal Codes that identify plan requirements include:

- BMC 12.12.040: Land Clearing Plan Requirements
- BMC 12.18.130: Landscaping Plan Requirements
- BMC 12.28.030: Conditional Use Permit Plan Requirements
- BMC 12.30.050: Preliminary PUD Plan Requirements
- BMC 12.30.080: Final PUD Plan Requirements
- BMC 12.36.030: Variance Plan Requirements
- BMC 14.04: Critical Area Alteration Plan Requirements
- BMC 15.08.020: Preliminary Short Plat Plan Requirements
- BMC 15.10.020: Final Plat Plan Requirements

In addition to the requirements of the Bothell Municipal Codes listed above, the following Site Drainage Plan Profiles are required for drainage review.

4.2.1 Drainage Plan View: Site Plan and Roadway Elements

- Provide property lines, right-of-way lines, and widths for proposed roads and intersecting roads.
- Provide all existing and proposed roadway features, such as centerlines, edges of pavement and shoulders, ditch lines, curbs, and sidewalks. In addition, show points of access to abutting properties and roadway continuations.
- Show existing and proposed topography contours at 2-foot intervals (5-foot intervals for slopes greater than 15 percent, 10-foot intervals for slopes greater than 40 percent). Contours may be extrapolated from USGS mapping, aerial photos, or other topography map resources. However, contours shall be field verified for roadway and stream centerlines, steep slopes, wetlands, floodplains, drainage tracts easements, and conveyance systems. Contours shall extend 300 feet beyond property lines to resolve questions of setback, cut and fill slopes, drainage swales, ditches, and access or drainage to adjacent property.
- Show the location of all existing utilities and proposed utilities (except those designed by the utility and not currently available) to the extent that these will be affected by the proposed project. Clearly identify all existing utility poles.
- Identify all roads and adjoining subdivisions.
- Show right-of-way for all proposed roadways, using, sufficient dimensioning to clearly show exact locations on all sections of existing and proposed dedicated public roadway.
- Clearly differentiate areas of existing pavement and areas of new pavement.
- For subdivision projects, use drawing scales of 1"=20'. For commercial, multi-family, or other projects, use scales of 1"=20', however, 1"=10', 1"=30', and 1"=40' are acceptable.

Show details for clarification, including those for intersections and existing driveways, on a larger scale.

4.2.2 Drainage Plan View: Drainage Conveyance

- Sequentially number all catch basins and curb inlets starting with the structure farthest downstream.
- Represent existing storm drainage facilities in dashed lines and label with "Existing."
- Clearly label existing storm drainage facilities to be removed with "Existing to be removed."
- Show the length, diameter, and material for all pipes, culverts, and stub-outs. Include the slope if not provided on the profile view. Material may be noted in the plan notes.
- Clearly label catch basins as to size and type (or indicate in the plan notes).
- Clearly label downspout and footing drain stub-out locations for those lots intending to connect to the storm drainage flow control system. Locate all stub-outs to allow gravity flow from the lowest corner of the lot to the connecting catch basin.
- Show datum, benchmark locations, and elevations on each plan sheet.
- Clearly label all stub-out locations for any future pipe connections.
- Clearly show on the plans all utility easements, tracts, access easements, Native Growth Retention Areas, Critical Area buffers, Critical Area Setback Areas, and building setback lines. Show dimensions, type of restriction, and use.
- Using arrows, indicate drainage direction of hydraulic conveyance systems.

4.2.3 Drainage Plan View: Other

- Show the location, identification, and dimensions of all buildings, property lines, streets, alleys, and easements.
- Verify the condition of all public right-of-way and the rights to use them as proposed.
- Show the locations of structures on abutting properties within 50 feet of the proposed project site.
- Show the location of all proposed drainage facility fencing, together with a typical section view of each fencing type.
- Provide section details of all retaining walls and rockeries, including sections through critical portions of the rockeries or retaining walls.
- Show all existing and proposed buildings with projections and overhangs.
- Show the location of all wells on site and within 100 feet of the site. Note wells to be abandoned.
- Show structural BMPs required by the King County Water Pollution Control Manual.

4.2.4 Profiles: Roadway and Drainage

- Provide existing centerline ground profile at 50-foot stations and at significant ground breaks and topographic features, with average accuracy to within 0.1 feet on unpaved surface and 0.02 feet on paved surface.
- For publicly maintained roadways, provide final road and storm drain profile with the same stationing as the horizontal plan, reading from left to right, to show stationing of points of curve, tangent, and intersection of vertical curves, with elevation of 0.01 feet. Include tie-in with intersecting pipe runs.
- On a grid of numbered lines, provide a continuous plot of vertical positioning against horizontal.
- Show finished road grade and vertical curve data (road data measured at centerline or edge of pavement). Include stopping sight distance.
- Show all roadway drainage, including drainage facilities that are within the right-of-way or easement.
- On the profile, show slope, length, size, and type (in plan notes or on a detail sheet) for all pipes and detention tanks in public right-of-way.
- Indicate the inverts of all pipes and culverts and the elevations of catch basin grates or lids. It is also desirable, but not required, to show invert elevations and grate elevations on plan sheets.
- For pipes that are proposed to be within 2.0 feet of finished grade, indicate the minimum cover dimensions.
- Indicate roadway stationing and offset for all catch basins.
- Indicate vertical and horizontal scale.
- Clearly label all profiles with respective street names and plan sheet reference numbers, and indicate all profile sheet reference numbers on plan sheets, if drawn on separate sheets.
- Locate match points with existing pavements, and show elevations.
- Show all property boundaries.
- Label all match line locations.
- Provide profiles for all 12-inch and larger pipes and for channels (that are not roadside ditches).
- Show the location of all existing and proposed (if available or critical for clearance) gas, water, and sanitary sewer crossings.
- Show energy dissipater locations.
- Identify datum used and all benchmarks (may be shown on plan view instead). Datum and benchmarks must refer to established control when available.

- Use a vertical scale of 1"=5'. As an exception, vertical scale shall be 1"= 10' if the optional 1"= 100' horizontal scale is used on projects with lots one acre or larger. Clarifying details, including those for intersections and existing driveways, should use a larger scale.
- Split sheets, with the profile aligned underneath the plan view, are preferred but not required.

4.3 Required Minimum Details

The design engineer shall provide details for all construction, including but not limited to the following.

4.3.1 Flow Control, Water Quality, and Infiltration Facility Details

- Provide a scaled drawing of each detention pond or vault and water quality facility, including the tract boundaries.
- Show predeveloped and finished grade contours at 2-foot intervals. Show and label maximum design water elevation.
- Dimension all berm widths.
- Show and label at least two cross-sections through a pond or water quality facility.
- One cross-section must include the restrictor.
- Specify soils and compaction requirements for pond construction.
- Show the location and detail of emergency overflows, spillways, and bypasses.
- Specify rock protection/energy dissipation requirements and details.
- Provide inverts of all pipes, grates, inlets, tanks, and vaults, and spot elevations of the pond bottom.
- Show the location of access roads to control manholes and pond/forebay bottoms.
- Provide plan and section views of all energy dissipaters, including rock splash pads. Specify the size of rock and thickness.
- Show bollard locations on plans. Typically, bollards are located at the entrance to drainage facility access roads.
- On the pond or water quality facility detail, show the size, type (or in plan notes), slope, and length of all pipes.
- Show to scale the section and plan view of restrictor and control structures. The plan view must show the location and orientation of all inlet pipes, outlet pipes, and flow restrictors.
- Draw details at one of the following scales: 1"=1', 1"=2', 1"=4', 1"=5', 1"=10', or 1"=20'.

4.3.2 Structural Plan Details

Any submittal that proposes a structure (e.g., bridge crossing, reinforced concrete footings, walls, or vaults) shall include plan sheets that include complete working drawings showing dimensions, steel placement, and specifications for construction. Structures may require a design prepared and stamped by a professional structural engineer licensed in the State of Washington, and an application for a separate non-residential building permit.

Section 5 - Conveyance System Design Standards

5.1 Standard Specifications and Details

All projects shall be designed and constructed to conform to the City of Bothell Design and Construction Standards and Specifications. Design and Construction Standards and Specifications can be attained by contacting the Public Works Department.

5.2 Conveyance System Design Standards

For basic conveyance system design in Bothell use the latest edition of the King County Surface Water Design Manual (SWDM), Chapter 4: Conveyance System Analysis and Design. The manual is available online at:

<http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual/2009-swdm.aspx>

5.3 Conveyance Standards for Fish Passage Culverts

Project proponents shall refer to Bothell Municipal Code (BMC) 14.04 for local fish passage culvert requirements. Conveyance standards detailed in the 2009 King County SWDM may need to be changed to accommodate fish passage pursuant to BMC 14.04.

5.4 Storm Sewer Closed Circuit Television Inspection

Before the City will issue final acceptance of the project, all new storm lines 12 inches or larger or in the public right-of-way must be inspected by Closed Circuit Television (CCTV) camera and footage provided to the City in DVD format. The City does not accept VHS tapes.

The CCTV camera must have zoom capability and a swivel head lens capable of turning and rotating 180 degrees to provide inspection of lateral connections.

Each individual storm main inspection, from catch basin to catch basin, must be recorded on one digital file. The City will accept multiple digital files for a single pipe only when the pipe reach cannot be recorded to one digital file due to extreme pipe length or obstructions in the pipe. The City will not accept multiple storm main inspections recorded on a single digital file.

The City will not accept dirty, blurry, foggy, submerged, or otherwise non-viewable inspections. Prior to inspection, the Contractor must have completed the manhole channeling, catch basin grouting, trench backfill, compaction, and final restoration of the street or easement. The City must have accepted the invert elevations and record drawings. All storm mains and laterals must be cleaned. All lines not clean must be re-flushed, cleaned, and re-inspected.

At least two days prior to the inspection, the Contractor must contact the City to inform the Inspector when and which lines will be inspected.

Immediately preceding the CCTV inspection, water must be poured into the system and must be visible on the DVD recording.

At the beginning of each storm main inspection, the information listed below must be electronically generated and displayed on the CCTV footage. This data must be continuously updated, and displayed on the CCTV footage, during the inspection.

1. Date of inspection
2. Contractor company name
3. Operator name
4. Upstream catch basin number to downstream catch basin number
5. Direction of inspection (upstream or downstream)
6. Pipe material and size

A 1-inch ball must be placed immediately in front of the camera, mounted such that the ball is visible and contacts the pipe bottom at all times. CCTV inspection cannot be paused once it begins. Only continuous inspections are acceptable. Pipe joints, catch basins, and lateral connections into catch basins must be thoroughly inspected by panning the entire connection, including manhole risers. Zooming inspection of all lateral connections is required.

The Contractor must bear all costs incurred in correcting any deficiencies found during the CCTV inspection, including the cost of any additional CCTV inspections that may be required by the City to verify that deficiencies have been corrected.

Section 6 - Small Site Drainage Review

6.1 Small Site Drainage Review Requirements

Small Site Drainage Review Requirements shall be those detailed in Appendix C of the 2009 King County Surface Water Design Manual (SWDM). Appendix C is available online at:

<http://www.kingcounty.gov/environment/waterandland/stormwater/documents/surface-water-design-manual/2009-swdm.aspx>

6.2 Adjustment to Sediment and Erosion Control Requirements for Projects in Small Site Drainage Review

Section C.3 of Appendix C of the 2009 King County SWDM is omitted by this manual. For consistency of sediment and erosion control applications in the City of Bothell, projects qualifying for small site drainage review shall refer to Section 2, Volume I, 2.5.2 of this manual for sediment and erosion control requirements. Volume II of the 2005 Ecology Manual provides detailed guidance on sediment and erosion control measures and requirements of those controls in the City of Bothell.

Projects qualifying for small site drainage review shall refer to Appendix C for specifications of Small Site Drainage Review TESC Plan. King County SWDM refers to TESC plans as ESC plans.

References

City of Bothell, Design and Construction Standards and Specifications (Surface Water Design Manual), Bothell, WA, 2000 edition.

City of Bothell, Municipal Code Title 14 (Environment), Bothell, WA, Ordinance 1996, passed July 29, 2008.

City of Bothell, Municipal Code Title 18 (Utilities Infrastructure), Bothell, WA, Title 18 was recodified from Title 13 by Ord. 1634. Prior legislation: 1622.

King County Department of Natural Resources and Parks, Surface Water Design Manual, Seattle, WA, September 1998.

King County Department of Natural Resources and Parks, Surface Water Design Manual, Seattle, WA, January 2009.

Puget Sound Action Team, Low Impact Development Technical Guidance Manual for Puget Sound. Seattle, WA, February 2005.

Washington Department of Ecology, Guidance for Evaluating Emerging Stormwater Treatment Technologies (TAPE). Publication number 02-10-037, Olympia, WA, January 2008.

Washington Department of Ecology, National Pollution Discharge Elimination System Western Washington Phase II Municipal Stormwater Permit. Olympia, WA, effective February 16, 2007.

Washington Department of Ecology, Stormwater Management Manual for Western Washington. Publication numbers 05-10-029 through 05-10-033. Olympia, WA, February 2005.

Culvert Grade and Flow Line

Unless shown otherwise in the plans, the culvert's grade and flow line must match that of the existing stream channel. Where the culvert's grade and flow line is relatively steep, debris and sediments pass easily through the culvert, resulting in abrasion in the invert and erosion at the outlet. Where the grade and flow line is relatively flat, sediment deposition in the culvert can become a problem. This is most likely when culverts are placed on a flatter grade than the existing stream channel.

All conveyance pipes must be installed on a uniform slope between structures. The maximum allowable tolerance for sags or bellies in a newly-installed pipe is 1/16 the diameter of the pipe. A request to deviate from this tolerance must be submitted in writing and is subject to approval by the Public Works Director.